THE SOCIETY FOR THE ADVANCEMENT OF MANAGEMENT

JOURNAL

Training Executives

Training Engineers for Management and Business

Discovering and Correcting Supervisory Weaknesses

The Engineer and Human Values in Industry

Applied Scientific Management—Chapter XII

Survey of College Curricula

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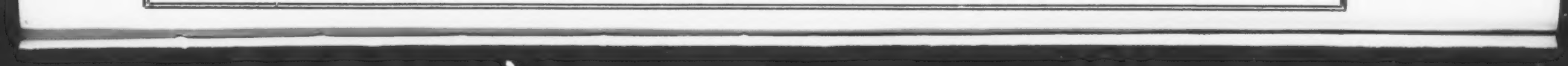

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IN THIS issue the reader will find problems of education for management treated critically yet constructively. The management world of tomorrow will in no small measure be determined by the education of today. And our Society has always the two mandates: of helping present-day managers to know and do the best, and of influencing in every possible way the quality of formal education of on-coming managers.

No one pretends that the problems of training administrators is solved. In respect to aims, point of view, content and the interplay of practice and bookwork, we are still, after twenty short years, in the formative stages. Indeed, the recognition academically of a science and art of administration as a separate and significant field of study is only gradually being achieved.

We shall, however, progress less rapidly than we should unless all who are influential in the world of management education recognize administration (and all its subordinate functional specialties) as *a branch of the social sciences*—not merely as an accessory to a utilitarian "business" training.

Managerial education must have a point of view. It is meaningless as an abstraction concerned with control procedures or impersonal "laws" of human relationships inhumanly viewed. Management works fundamentally in relation not alone to corporate aims but to social aims. Like every other social science it is ministering to a facilitation of the social aim of human well-being.

The first and next task of management educators is not merely curriculum building. It is a clarifying and orienting of the idea of administration as an indispensable social function in a complex society. For administration is a concept of definite proportions; and knowledge of it both experimentally and theoretically is now substantial even if still in need of coherent compilation.

Administration proceeds in a vacuum, however, with respect both to theory and practice unless thought of always in clear relation to purpose and objective. The study of organization purposes—how and when they are formulated, their relative value, best methods of transmitting and interpreting them—becomes, therefore, central and primary to creative thinking. Finally, the vital realm of purpose is a realm of values. Some basic wisdom has to be employed in defining what it is valuable to aim for in any specific case. The future administrator, like the ruler in Plato's Utopia, thus has in the last analysis to be a philosopher! Has he not, therefore, to be educated as such?

Executive Training[1]

By HAROLD B. BERGEN

Director of Industrial Relations, The Procter & Gamble Company, Ivorydale, Ohio

Effective management today depends in large measure on the skill and knowledge of executives. And it has been found that a sufficient number of persons with the required qualifications do not "just grow." It is necessary therefore to train them.

How to do this is the concern of most organizations and the experience of successful companies is always welcome.

Introduction

THE importance of executive training should need no additional emphasis at the present time. Unfortunately, however, most executive training is confined to foremen and to potential junior executives whereas, if it is to be effective, it should start at the top. An astute commentator after a fairly recent comprehensive field study of industrial training drily observed ". . . it is difficult to get foremen to study, but still more difficult to get vice-presidents. Vice-presidents, like professional educators, are inclined to think their education completed."

In discussing the subject of executive training, it might be well for us at the outset to consider what we mean by the word "executive" and the word "training." May I suggest that for the purposes of our discussion we consider any member of the management from the president down to the lowest level of supervision as an "executive" as distinguished from a factory worker, a clerical employe, a technician, or a salesman. Of course, this is not a hard and fast distinction but I believe it will suit our purpose.

The word "training" on the other hand is perhaps more difficult to define.

It is the teaching and forming by practice of right habits. It involves not only the statement of what these habits are but exercise in the use of them.

Personally, I like to think of education and training as the main duty of an executive. This thought is not new but many executives today think of training as something to be done *for* rather than *by* them.

Management must establish fundamental policies which will be plans of action to achieve the objectives of the company. It must develop and co-ordinate an organization for carrying out these policies. And it must develop methods for the personnel of the organization to use in carrying out the policies which have been established. In this discussion, therefore, I shall cover: first, executive training policies; second, organization for executive training; and finally, executive training methods.

Executive Training Policies

The following two basic policies will, I believe, provide the fundamental plans of action for executive training:

1. Train all supervisory and executive employes to discharge their responsibilities more effectively.

2. Prepare selected employes in various grades of positions for discharging effectively the responsibilities of higher grade supervisory and executive positions.

These policies require little explanation. Certainly, no executive has ever been considered overtrained. In these days, when the only thing we can be sure of in business is change, the task of executive training becomes increasingly important. The education and training of the management group is a continuous process which will never be completed.

In addition, there is a need for the mobilization of promotional material. Executives die, retire, and leave the company. Business expands and additional executive positions are created. Men must be promoted to these posts. It is desirable to have a number of carefully selected employes in various levels of the organization prepared systematically for higher management posts. This should include also the general forces; a number of factory workers should be carefully selected, earmarked, and given pre-foremanship training and the same plan should apply to the development of a number of salesmen for sales supervisory positions.

Organization for Executive Training

It has already been indicated that training is the responsibility of the management. Executive training must start at the top. The chief executive must set the

[1] Address before the Pittsburgh Personnel Association, January 5, 1937.

example by using sound training methods. Every executive should make it his chief function to develop men. The success of executive training is dependent primarily on the sincere participation of the management from the top down.

The inculcation of such habitual behavior in the executive staff will necessitate the establishment of a sound organization structure which clearly defines in the form of an organization manual (kept up to date) the lines of authority and responsibility from the president down to the lowest level of supervision. This organization structure must be continually interpreted to the personnel so that there will be no misunderstandings of who is responsible for what. Unless this is done the effectiveness of executive training will be greatly handicapped.

Efficiency in executive training also requires the centralization in a training specialist of the responsibility for co-ordinating the executive training program. In a smaller company this responsibility would be assumed by the director of personnel and industrial relations reporting to the president but in a larger company the staff of the personnel department should include a training specialist to work closely with the line executives, preparing training material for them and advising them relative to training methods.

In addition to the structural or static aspect of organization there is the operating or dynamic aspect. It is not enough to design the organization structure; the units of the organization must be continually co-ordinated by the president and vice-presidents if it is to operate effectively. James O. McKinsey has succinctly pointed out that, although functional classification of activities in the management organization structure has developed specialization and, hence, greater efficiency, it has at the same time made the problem of co-ordinating the various units and specialists the most difficult problem of management. If this is true, then the most important subject to be included in an executive training program is management organization—both the structural and operating aspects. Fortunately, there is some indication that this is being recognized in a number of companies. We shall have more to say about this, therefore, in our discussion of methods of executive training.

Executive Training Methods

In discussing the methods for training executives let us first consider the training of present executives and later the training of men considered as promotional material.

Job Analysis: The first step in executive training as in any specific training project is to make a job analysis of the work of the men to be trained. The techniques of analyzing duties and difficulties as a basis for curriculum construction have been amply described by Dr. W. W. Charters and others. Mr. L. A. Appley, Supervisor of Education and Training, Socony-Vacuum Oil Company has followed the practice of having each executive list his own duties and difficulties in collaboration with his immediate superior, and of having each executive hold group meetings with his immediate subordinates to analyze and discuss specific difficulties in the relationship of the duties of each executive with those of his associates. In this way many organization problems, both structural and operating, were straightened out and an organization manual developed by group thinking. It would seem that this method is one of the best for analyzing executive positions, developing an organization structure, and co-ordinating the activities of the various units of the organization.

On the basis of the job analysis, a specification for each executive position should be prepared, listing the major duties of the position. Each major duty may then in turn be broken down into its component parts and this breakdown continued to a degree which will permit the construction of practical training outlines for each executive position. These may be used for the personal coaching of executives. It will be desirable also to prepare a master list of duties for each group of executive positions of approximately the same level in the organization. In fact, there are a number of duties which seem common to all management posts from foreman to president. These master lists may be used in the same way as the individual lists as a basis for constructing training outlines and manuals.

A number of company training men have prepared specifications and training outlines for management positions. One of the most significant of such projects has been that conducted in the Eastman Kodak Company by A. B. Gates, Director of Training. Mr. Gates found by job analysis that most supervisory difficulties were due to a lack of definite knowledge of (1) company objectives and policies, (2) the individual's responsibility and authority, and (3) inter-unit and inter-individual relationships that grow out of these responsibilities. In other words, most of the difficulties of management were due to faulty executive training in organization, both structural and operating. Before

proceeding further with the executive training project, it was necessary to establish a sound organization structure, to interpret this to the personnel, and to make provision for co-ordinating the various units and positions which compose the organization structure.

In addition to specific company projects, a number of writers have prepared papers or texts on executive training based on their analyses of executive positions—especially the work of foremen—in a number of companies. Several years ago, G. L. Bergen and I attempted such an analysis and presented our results in a paper before the American Management Association. I shall draw on that paper as well as on the reports of other training men in stating briefly what I believe should be the subject matter of executive training. This may be divided into two main classifications: background information and managerial skills.

Subject Matter: In the first place, as Dr. Charters has ably pointed out, there is a need for background training. This may well include the following subject matter:

1. General company background:
    a. company history and its place in the industry.
    b. company objectives and policies—especially policies relating to employes.
    c. the organization structure of the company.
    d. company products and their uses.
    e. the financial statement of the company.
2. Departmental processes of the company:
    a. manufacturing processes.
    b. marketing and merchandizing methods.
    c. purchasing procedures.
    d. financial procedures (e.g., credits and collections).
    e. budgetary, cost accounting, and statistical procedures.
    f. employment and other personnel procedures.
    g. office procedures.
3. General business background:
    a. new developments in other companies, in the industry, and in the world of business.
    b. workmen's compensation, social security, and labor legislation.
    c. the labor movement.
    d. fundamentals of economics and government.

Far more important than background material is the acquisition of managerial skills. No matter how well-informed he is, the executive must acquire skills in managing a unit. These skills will include:

1. Budgetary and cost control.
2. Routing, scheduling, and dispatching.
3. Handling and training subordinates.
4. Control of quality.
5. Co-ordination of inter-unit and inter-individual activities.

There are a number of other techniques of management which either run through or are subdivisions of the five subjects listed. Those which apply more to plant management include such items as plant layout, repair and maintenance of equipment, storeskeeping and care of materials, accident prevention, time and motion study, waste prevention, and the like.

Closely tied up with the managerial techniques which have been mentioned is the development of the personal qualities which a good manager should possess. An executive's performance can be improved occasionally by the correction of certain personality traits. Just what qualities constitute a successful executive and just which of these yield to development are matters of opinion at the present time. It will be desirable, therefore, for the top executives in group meeting to agree on a list of such qualities and to embody these qualities in a scale for rating executive behavior.

In determining what the subject matter of executive training should be during any given period, it might be well to follow the procedure advocated by Mr. Appley which provides for recommendations from the men to be trained relative to what they feel will help them the most. What are their greatest difficulties; their most pressing problems; the things of greatest interest to them?

Techniques of Training: After analyzing the executive positions and constructing specifications, training outlines, and training manuals, the methods of actually training the executives in this subject matter must be carefully planned. I do not believe we know enough yet about training techniques to say there is a one best way. Background material can be put across in a number of ways including training manual assignments, special bulletins, lectures and discussions, reading lists, routing of magazines, motion pictures, and personal coaching.

It is desirable of course to follow up the presentation of this background material to determine to what degree the information has been acquired and there are various devices which may be used for this purpose. A training aid which has met with some favor is a form of informational test devised by psychologists and consisting of types of items known as multiple-choice, completion, and true-false. The men being trained are

invited to check their knowledge by means of these tests which require very little pencil work.

The training of executives in management techniques must be primarily training on the job. Certain information regarding these techniques can be presented by the methods used for background training. The executive may also be asked to read the daily or weekly correspondence folders of his associates and his chief. The latter may route certain letters to him for comment and suggestions. He may be asked to read selected correspondence files and make a list of the managerial problems indicated therein. He may sit in his superior's office as an observer for a given period. There are a number of such devices which the ingenious executive can use in imparting management information to his immediate subordinates. But the acquisition of managerial skills can be effected only by actual management. Each executive should receive careful personal coaching from his immediate superior. At the start these may be in the nature of planned conversations or demonstrations. The junior executive may not only be told how to handle certain problems but also be called into the office occasionally to watch his chief handle some specific management difficulty. He may then be called on to handle a similar problem himself under the guidance and correction of his chief. Finally, he will be allowed to handle such problems himself with an occasional but continuous follow-up by his chief.

The use of group meetings as a managerial training device—especially the conference method for training foremen—has been advocated by many training specialists. This is a practical device if each meeting is planned and executed properly. Care must be taken also to provide the proper physical facilities. The group must be limited in number—never more than fifteen. There is also the question of who should conduct the meeting. Trained conference leaders from the training department or from the outside have been used by many companies. Personally, however, I believe that better results will be obtained if the conference leader is the immediate superior,—in fact, it should be a responsibility of each executive to hold frequent planned meetings with his immediate subordinates for training purposes. This plan of procedure has been followed by the American Rolling Mill Company, the Socony-Vacuum Oil Company, the Eastman Kodak Company, and others. To be highly effective this procedure requires group meetings of the vice-presidents led by the president, followed by group meetings of the men reporting to each vice-president and led by him, and so on down the line.

Committees can be used judiciously as training devices. Here again, however, each committee meeting must be carefully planned and executed. There must be a definite program over a given period.

An important part of the procedure of group meetings is the development of training material for distribution prior to each meeting and of additional material to be added as the result of each meeting. Such material should be developed in meetings of the top executives and expanded in greater detail as meetings are held down the line. They will become a valuable collection of management notes. The Eastman Kodak Company has been unusually successful in the development of this type of training material.

In addition to personal coaching on the job and group meetings, the executive may be sent on trips to other companies and to conferences of management societies at which practical management difficulties will be discussed. The proceedings of such conferences may be routed to the desks of various executives.

Selection of Junior Executive Talent: So far, we have discussed primarily the training of present executives. Let us now consider the training of men considered as promotional material. Before doing so it might be well to emphasize the importance of selecting the right juniors for executive training. There are, of course, two main sources of executive talent: within the company and outside. Continuous effort should be made to discover outstanding men in all levels of the organization. A number of men in each level should be selected by their superiors for listing on a roster of men designated for special training. This list should be reviewed semi-annually by the top executive group, new names added and some of the present group dropped as desired. There must be a careful follow-up of these men in training by means of personal interviews, periodic ratings, special reports, and the like. Department heads should be asked to nominate new candidates just prior to the semi-annual review of the progress of the men in training.

It will usually be found necessary to go outside the company for additional junior executive talent. In actual practice today only a small percentage of men in the rank and file will be found to possess the capacity to progress to important executive posts. This may be due in part to the tremendous development of American educational institutions during the past twenty or thirty years and the present smaller percentage of outstand-

ing men who leave school before completing college or at least high school. It may also be due in part to the increase in complexity of executive duties and the rise of business management as a profession. In spite of the fact that a company should make every effort to discover executive talent among the rank and file, it will be found necessary, in many cases, to select additional men for executive training from the senior classes of colleges and universities. In fact, the recruitment of college seniors has become a fine art due to the terrific competition of various companies for the best men.

Developing Junior Executives: Let us assume that we have selected the right number of good men for executive development; how shall we train these men? In answer, let me say that the best way to learn the art of management is to manage a unit. Each man to be trained, therefore, should be given intensive training in the work of a small department with the expectation that he will be made the head of that department in a short time. In The Procter and Gamble Company it has been found practicable to make a man—who has been properly selected—the foreman of a factory operating department after approximately six months of pre-foremanship training. This requires the careful scheduling of his training and rapid routing through the manual tasks and operations of the department. It also requires careful coaching by his immediate superiors and a number of planned conversations with the superintendent of the factory in the latter's office. In this connection, a number of outlines for planned conversations have been developed for the use of superintendants.

This coaching continues after the man is made foreman as it is then that his real management training begins. After a period of approximately a year, the man is routed to other departments as foreman in each case for a short period, providing his performance leads the top management still to feel that he is worthy of special executive training. He is then promoted to the next higher level—the position of supervisor—and supervises the work of a number of foremen. His personal coaching is continued and his routing through other divisions of the factory carefully planned as long as he is considered material for further executive development. In this way, outstanding men have become factory superintendents in six years.

As I have indicated previously, the follow-up of the men in training is very important. Each of the major executives should make it a point to interview at least once every six months each man in training and to record his impressions for the man's employment and training folder. The training man should keep in frequent contact with the men in training and record his observations. But the principal follow-up should be periodic ratings of each man by his superiors on a carefully constructed scale for rating executive behavior. Such a scale should prove very helpful in the correction of personality traits. An excellent example of a rating sheet for junior executives as developed by the General Electric Company appears in the November 1936, number of *Personnel.*

There are a number of other follow-up devices, including weekly or monthly progress reports from each man in training and special technical reports covering his recommendations regarding proposed changes in policies, organization, personnel, equipment, or processes. The man may be called on to make a talk before a group of his associates. He may be given special quizzes. He may be given a check list for rating himself on various aspects of executive behavior.

The techniques which have been mentioned for training present executives may also be utilized in training junior executives. In fact, the same methods may be used in developing talent in both groups.

Conclusion

In conclusion, let me repeat that effective executive training will solve most of the problems of management and that this training depends primarily upon the sincere interest and backing of the president and other top executives. It depends also upon the careful working out of a sound organization structure and upon the making of provisions for co-ordinating the various units and positions which comprise that structure. Finally, it depends upon the careful planning and the continuous follow-up of the actual training of subordinates for which the line executives must be responsible. The training specialist can be of assistance to the extent that he helps the line executives plan and execute the training of their subordinates.

Training Engineers for Management and Business

By ASA S. KNOWLES

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The training that the engineer gets in the scientific approach to problems has led many engineers into successful careers as business managers.

More of such technically trained executives are being and will be sought as the complexities of management increase and it is necessary therefore to provide some means of training engineers specifically for business administration.

NO EDUCATIONAL institution can justify its existence unless it is meeting to the best of its ability the current needs of its community. In the field of engineering education, the need for making available to students more training in business and the social sciences is increasingly apparent. The vocational horizon of the engineer today does not confine itself to the narrow limitations of strictly technical work, but includes nearly every phase of human endeavor where ingenuity, resourcefulness, and educational background have a rôle to play.

At a conference on the teaching of labor relations in engineering schools held nine years ago, an executive officer of a New York bank concluded a statement on training men for business which is even more significant in 1937 than it was in 1928: "Business—our national prosperity—depends more and more on the efficiency, the smooth operation, of our production machinery. . . . For this reason more and more of the executives I meet are men with an engineering training. More and more are the business owner, the investor, and the banker turning the management of industry over to the engineer—and the engineer must not fail. He must be prepared for his new task—the whole task. . . . Real knowledge of sound management principles as applied to personnel relations must be a part of every executive's equipment."

Still more recently we find the technical employment and training manager of a large manufacturing company writing to the deans of several colleges in the United States during 1934 as follows: "It is a matter of significance that the majority of those engineering graduates who have entered industry during the past three years have been chosen for their combination of engineering ability and commercial aptitude."

The entry of trained engineers into business and positions of administrative authority is not at all new. In 1930 it was shown by a survey conducted by the Society for the Promotion of Engineering Education that nearly 60 per cent of college trained engineers ultimately found a livelihood in non-technical and commercial fields. Many of them undoubtedly started to work in the fields for which they had studied, but they eventually found managerial or administrative work more attractive.

There are several reasons why the engineer has successfully invaded the world of commerce and has frequently risen to the executive management and direction of industrial and commercial enterprises. The following analysis of these reasons leads one to believe that the next decade will find increasing numbers of engineers in positions of high managerial responsibility.

1. The engineer has acquired through scientific studies those habits of mind and attitudes toward work which make for his success in the administering of industry and commerce. "Engineering," according to Mr. Gano Dunn, "is a method of thinking. The engineer brings from his professional training sound and practical logic, accuracy, and judgment."

2. The number of highly trained jobs of the research, design, or development type is relatively small compared with the number of operating jobs requiring a basic engineering background together with other abilities of business value.

3. Business as a calling has been found to be more lucrative than has engineering, particularly the jobs in which the engineering training serves in good stead. An example in point is that of the sales engineer who uses his technical background to sell machinery and equipment; often his compensation is considerably larger than that of his brother (perhaps no less capable) who is at work designing the equipment to sell.

4. A factor of particular significance in recent years

in forcing engineers into the business world is that of *pressure of numbers.* The graduates of engineering colleges have become more numerous, and the recent depression not only retarded the absorption of recent graduates, but threw experienced hands upon the market. In such periods competent young technicians renounced plans for a scientific career for positions in the world of commerce.

5. A further potent force which has attracted many engineers from strictly engineering fields of endeavor may be termed *demand for technical administrators.* Here the engineer has a peculiar advantage. His work is essentially that of attending to business matters, but these pertain to operations and functions which are in themselves of a technical nature and which can best be administered by one who understands both the technical and commercial problems of the particular industry. In no position is the management trained engineer at a better advantage. His technical training serves him in good stead, and he is not at a loss to see his plant as other than a mechanically functioning unit. He can act with equal intelligence on a problem relating to his shop processes or laboratories or one pertaining to his selling, accounting, and personnel activities.

Because there are to be found in both governmental and private agencies a large number of positions which require a technical background, and because it seems easier for the engineer to acquire proficiency in administrative skills than for one who has no training in scientific work to acquire the latter, the scientifically trained engineer is frequently sought after to fill these jobs. This is a vocational field that is likely to continue to expand for some time to come. For proof, one has only to turn to the ever growing service and regulation bodies of national, state, and local governments. The permanent number of civil servants in the United States is fast growing, and increasingly engineers will seek this type of employment. The pure technician is and will be much needed, but his brother who has both technical and management skills to offer should be in even greater demand!

Obstacles in the Path of Management Training for Engineers

Engineering college faculties have been slow to adopt programs of study which combine business and engineering for a variety of reasons:

The first two need be mentioned only: the failure of educators to appreciate a growing demand for a new specie of engineer—the management engineer; and the time honored obstacle of insufficient funds to finance new departures in established curricula which require additional faculties, libraries and facilities.

Another real impediment to offering specific management training courses in engineering colleges is found in sheer "opposition to change." This is not an uncommon attitude still among educators who sincerely feel that the standard scientific training of the past has produced competent administrators, and, therefore, teaching management to engineers would do little except weaken established programs of study.

The success of one generation along certain lines does not imply that a like achievement can be even approximated, under new conditions, a few decades later. For example, the land surveyors of 1890 who built roads would find the construction of a modern highway quite out of reach. Decidedly different, too, are the management skills of these two periods.

Coupled with this opposition to change, there is a lack of understanding of the place and scope of management in the life work of the engineer. Those educators who have not overlooked entirely the value of business training for engineers, have considered it as something for later cultivation. This group is the nucleus of those who hold that management training for engineers is clearly a graduate school function. Such an attitude, however, does not solve the problem for the bulk of college graduates who complete their formal professional training in the four or five years of undergraduate work.

A final obstruction of no small importance may be termed an unwillingness to accord to management courses equal importance with the more technical offerings of the college. This is no less true of the formal degree programs which combine engineering and management, than of the separate subjects taught. Educators have often called the combined programs "hybrid courses," neither a real business curriculum, nor a good engineering one.

Furthermore, business as a profession, and its qualifications as a science have not been firmly established; and no few educators still associate business training with the secretarial or two-year business college training. This prejudice has been removed partly by the growth of business schools of collegiate grade, but "underrating" is still a factor to be reckoned with.

The New Outlook

Fortunately, today some of our institutions of learning are at work building organized programs of study

in engineering and business. In the first place, the experience of the engineering alumni shows clearly the need for more business training; secondly, it is recognized that an increasing number of engineering college graduates will tend to earn a living in administrative engineering and commercial work, and finally educators are beginning to see the place and function of the management engineering program in relation to other curricula.

Training the Engineer for Management and Business

The engineer who will ultimately find himself in non-technical or managerial work, will find that he has open to him four options in getting what business training his job requires: (1) the pursuit of post graduate work in the business field; (2) the obtaining of knowledge on the job through a sort of apprenticeship training; (3) undertaking a course of study by himself or taking a correspondence course; and (4) the obtaining of knowledge of the fundamentals in business management during his college course. Let us examine each of these options in relation to the education of the engineer.

Option 1. Post graduate work is not possible for many graduate engineers. There are few so situated that financial considerations will not be a barrier, even though they live in proximity to a school offering a desirable program, while a vast majority will find their jobs located far from university centers.

Option 2. There was a day when a student could go through the ropes and progress as did his father in his youth and early manhood. So long as business organization was limited to relatively small units there was time for employer and employe—boss and apprentice—relationships. A man could learn much from his superiors and was rewarded with recognition and promotion on the basis of his demonstrated ability. Today we are surrounded on every hand by big business where the employe is lost in the vast number of workers. The old time employer who trained his own men is passing out of the business scene. There is no less need for training—in fact the need for it is more necessary than ever if one is to get ahead,—but the training is being left to the individual and he is expected to bring with him to his job an appreciable number of these skills.

Option 3. There are but relatively few men who can discipline themselves to a system of self-education, and although there exist many excellent correspondence courses in business training, the achievements that might be desired are again hampered by inability for self-discipline. Furthermore, some of the tool subjects of business cannot be taught to best advantage outside the classroom.

Option 4. It would seem, then, that the most desirable place for engineers to acquire an understanding of business management is during the pursuit of the undergraduate professional training program.

The engineering college is failing to meet its obligation to a large number of its students until it apprises them of this need for getting business training during a time when school work is the principal business. If some management courses cannot be made compulsory, they should, at least, be recommended as electives.

Meeting the Responsibility

There is no simple formula by which the engineering college can meet the need for training the undergraduate engineer in business principles. Each college must attempt to satisfy the need in the light of its own experience. There are some steps, however, which must be taken by any colleges wishing to succeed in this work.

In the first place, the college must clearly define for itself the place and importance it will attach to management training. In this connection, it must decide also that if management courses are offered, it will attach as much importance to them as to work in the more technical fields. In the second place, the college must determine what proportion of its students should be encouraged to take a program of study which combines business and engineering training, and what proportion the advanced technical training. Finally, the prospect of success for a professional course, which would combine business and engineering must be determined upon, and if established, it should be accorded a position of equal importance with other professional curricula.

There are few undergraduate engineering students today who understand properly the real function and opportunity of the management trained engineer, and the engineering college faculty must recognize the need of explaining the management training to undergraduates at an early stage of the college course. Not only should attention be called to the need for engineers with management training but also to the experience of the particular college and others in regard to graduate placement.

There may be found in every engineering college a large number of undergraduates who for a variety of reasons are not well adapted to continue advanced technical work. When these men attempt to follow an

ill-chosen profession, they frequently remain discontentedly at the bottom of the professional salary scale and in some instances not only give their institution a black eye, cost their employers large sums in mistakes, but also are no credit to themselves. These men ought to be urged to find a livelihood in the field of commerce, the management of industry, and less technical phases of production work, where engineering training will stand them in good stead. Their chances of success are better.

The Management Program

A satisfactory business and engineering program for the undergraduate engineering college may be supplied through (1) a system of electives; (2) a designation of specific management subjects which must be taken as a part of the professional engineering degree requirements; and (3) a formal program in which engineering fundamentals and management are offered as a course leading to a specific degree in Industrial Engineering or Engineering Administration. In some institutions what is known as a management option is offered to students who do not care to continue advanced technical work, but who wish to enter the administrative side of their chosen profession. These students pursue the engineering fundamentals in their respective fields and substitute business courses in the upper years for much of the advanced technical work. They receive a degree different from that of those who have continued the study of advanced technical work.

No matter what may be the "modus operandi" of the management program in the engineering college, there is one element in connection with it that cannot receive too much emphasis. The management courses should be taught by a department devoting its entire time to teaching business management to engineering students, or one which already handles the management program as part of an established engineering and business program, such as industrial engineering. Few teachers can successfully satisfy two masters, and, too often, the management field has been treated as a side issue by the professor who also handles technical and unrelated courses.

When the management courses are offered as electives, the student should be allowed considerable latitude in his choice, but should be intelligently guided by his own departmental adviser as to the management courses from which he is likely to benefit most.

Perhaps the principles of accounting and industrial management might be required of all engineers, regardless of professional courses. A course in public utility administration and rate making is more suitable for the electrical engineer than for the chemical engineer, the latter standing to benefit more from a course in manufacturing or production processes, particularly if he wants to work in a chemical industry. For both groups, a course in personnel relations would be of value.

Again, it cannot be emphasized too strongly that in this type of management elective program the student should not be allowed to sacrifice strictly professional courses (which will be of importance to him in his work after graduation) in favor of management courses. In this connection it might be well for those in charge of specific curricula to designate the courses for which management program substitutes may be made with the least harmful results.

Industrial Engineering [1]

For factory work, production, and many lines of commercial enterprise, the best possible training is what many institutions call Industrial Engineering. It consists of a program of study in which the student is given a foundation in the elementary or tool subjects of mechanical engineering combined with an intensive program of study in business management and selected engineering courses specially designed for men who seek situations in the administration and management of industrial enterprises. A special branch of knowledge that has grown up is that of motion and time study.

Industrial Engineering is a professional course as is civil engineering which presents the essential knowledge of the operation and organization of production, as well as an understanding of the managerial skills of accounting, finance, sales engineering, production planning, personnel administration, the use of statistics, and the place of motion economy and time study in the organization.

A man so trained sees industry in its broad relationships and because of this should be both sought after and singled out for promotion.

In the factory the trained industrial engineer at work is not always designated by a title that makes his presence readily apparent. He may be found in any one of the following pursuits:

Accounting and Cost Work	Personnel Work
Factory Clerical Work (Payroll Clerk)	Shop Work
Motion and Time Study Work	Sales Engineering
Production Planning and Control	Safety Engineering
Plant Layout and Traffic Management	Inspection

[1] This is called the Production Option where given as the Management Option of the mechanical engineering program.

In these several pursuits [2] his title may be any of the following:

Methods Engineer	Administrative Engineer
Industrial Engineer	Efficiency Engineer
Cost Engineer	Rate Engineer
Sales Engineer	Management Engineer
Finance Engineer	Plant Engineer
Layout Engineer	Safety Engineer

Motion Time Study Analyst

In the survey made by the Committee on Education of The Society for the Advancement of Management (see page 91) it is pointed out by Professor Diemer that in the United States today there are seventeen institutions offering programs in industrial engineering and granting specific degrees of Bachelor of Science in Industrial Engineering upon completion of the course. Fourteen additional institutions have programs of study which are essentially industrial engineering training programs but which offer a general degree. Thirteen other institutions do not offer industrial engineering as a training program but offer electives and required courses in the business management field.

At this point it should be clearly understood that an industrial engineer is a man whose background is in the mechanical engineering field in addition to which he has studied commercial subjects, while engineers who have followed courses of study in other engineering fields (electrical, civil, chemical, etc.) prior to or consecutive with the business training should not be catalogued as Industrial Engineers. They may be more properly designated under other titles.

How Should These Courses Be Designated?

For a number of years there has been a considerable controversy in engineering educational circles as to the proper terminology to be used to designate the course name and degree title attached to combined training in engineering and business.

Some institutions have cast out the term industrial engineering as being non-descriptive.

In the June 1936 "Journal of Engineering Education," Dean Hoover of Stanford University College of Engineering says: "Industrial engineering is a popular synonym used to evade the presumed stigma attached to the term 'efficiency engineer.'" The word is non-descriptive of any particular function because the work of almost any engineer is industrial in every sense. He says further, "The title should be replaced by more descriptive titles such as 'efficiency engineer,' 'management engineer,' 'production engineer,' or the like."

This lack of confidence in the name Industrial Engineering to express the above designations may be attributed in part to its newness; the public has not come to associate these occupations with the term, while more definite associations are made with other engineering titles. However, not all laymen think of civil engineering as embracing hydraulics, sewerage, sanitation, public health, highway and construction work. To those in the engineering profession they are familiar because time and experience have acquainted them with these terms, and so, in time, will an industrial engineer be thought of in relation to his proper category.

As for the men who pursue a management elective program, in combination with chemical, electrical engineering, etc., they will be harder to catalog and their occupations will necessarily overlap those of the industrial engineer. But in time, their right place in the social picture will be defined by the enterprises who find their services valuable.

The result of all this has been for the engineering schools offering programs of study in engineering and business to adopt a whole array of names which have never been descriptive of courses offered. Some of the more common of these have been Management Engineering, Administrative Engineering, Engineering and Business. There is real need for standardization of these titles; a standard title should be adopted which will represent to student, faculty, employer, and the public a program of more or less specific content and indicative of the capabilities of its graduate.

Present-Day Problems

There is still some need for eliminating the "hodge-podge" programs which some colleges continue to offer. Some of these have existed because certain social science subjects already being taught in affiliated departments of a university or college can be modified slightly in content and made available to engineers. Courses which must cater to the degree requirements of several departments seldom meet any of these well, and the result is usually a disgruntled professor, a displeased student, and an unsatisfactory result. A liberal arts course in accounting cannot meet the needs of a student who must ultimately pass the C. P. A. examinations to practice his profession. So long as these programs prevail, the institutions which have formulated well-correlated

(Continued on page 80)

[2] This is not an exhaustive list.

Discovering and Correcting Supervisory Weaknesses

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The supervisor who is effective is the one who has learned to adjust himself to the work relationships of the group he is supervising and at the same time to the management,—and to bring these two into alinement for stability.

In order to bring this about and discover where weaknesses lie, it is sometimes necessary to seek the aid of trained consultants to work with supervisors and foremen.

SOME measure of stability in human relationships is a prerequisite for industrial progress. This necessary stability is provided by sentiment, tradition, and accepted codes of living. When such stability is present it forms the basis for the exercise of enterprise and ingenuity in the technological development of industry. At the present time, however, changes seem to be occurring in the employer-employe relationship, which introduce new unknown factors in the problem of management.

In any problem, technical or human, the presence of too many unknown and unpredictable variables makes a successful solution impossible. If, for example, changes in technology tend to induce changes in traditionally accepted human relationships, then management tends to become over cautious in carrying out policies which are commercially and technically sound. When the number of unpredictable factors becomes too great, there can be no reasonable certainty about the results of a given course.

Recent Research

Recent research on the problem of the influence of human factors in industrial situations shows that industrial managements have a considerable opportunity to control the forces which make for stability in human relationships. This paper cannot attempt a systematic résumé of these findings. I propose to suggest a specific plan for applying these results to practical situations.

In a general way I have tried to combine two points of view. One point of view considers the problem of individual adjustment to the work situation. One example of research along this line is to be found in Hersey's "Workers' Emotions in Shop and Home." Another point of view considers the problems of closely knit working groups in industry, and has been described in Mayo's "The Human Problems of an Industrial Civilization" and Whitehead's "Leadership in a Free Society."

Underlying both points of view is the emphasis upon the immediate work situation as of importance in determining the relative stability of human relationships in a plant. Hersey emphasizes the individual's adjustment to persons with whom he comes in daily contact. Mayo emphasizes the importance of accepted and traditional standards of the small group, the members of which are in actual personal contact with each other while at work. Both studies point out that the ordinary explanations given by individuals for their own behavior are rationalizations which tend to conceal rather than to illuminate the real motivating factors.

Statement of the Problem

The problem is that of introducing a measure of stability into the human relationships in a plant. Such stability implies a degree of individual contentment on the part of the employes with an accepted manner of living. Just as management needs considerable stability if it is to carry out its technical plans, so individual workers need stability in relationships with others in the plant before they can exercise ambition and their full capacity. If this is lacking, the problem of living becomes too confused for the individual and the uncertainties tend to keep him from satisfactory performance.

Criteria for Judging Plans

On my interpretation of the results of the research mentioned above, I base the following proposed criteria for testing plans calculated to lend stability to employer-employe relationships.

1. Does the plan deal primarily with inter-personal relationships between members of the working group?

2. Does the plan discover and utilize the traditional and accepted code of the intimate working group?

3. Does the plan recognize individual variations from the normal adjustment in the particular group and suggest effective ways of dealing with them?

The Usual Form of Industrial Organization

Let us consider how these apply to supervision in industry. In the usual industrial organization, a typical working group is composed of a number of workers directed by a foreman. The foreman has the responsibility for considering all the factors of relationships between workers, the leadership of the group, and the way to secure the best from each man. He is confronted not only with the responsibility for supervision of the technical process, but also with the problem of personal leadership.

If the bond between the foreman and the workers is insufficient to unify the group in the purpose of effective production, the group tends to break up into informal groups, in which the aims may be at variance with those of the formal leader. If the leadership is strong, the foreman may be able to tide the group through technical changes which involve shifts in their habitual relationships and activities without serious impairment to the unity and morale of the group.

The extent to which the leader understands the informal code of the group, determines his ability to keep his men's loyalty. If the higher management also understands the problems which he faces, he can give them facts which will be of value in the formulation of company policies. In addition, if the foreman possesses a real skill in appraising the individual adjustment of workers in his group, he can enlist co-operation.

In industry as a whole, not nearly so much attention has been given to these matters as to the development of technological factors. Yet management is committed to a program of technical advance based on controlled change in the mechanical methods, and requiring elaborate human adjustments. Should not industry then provide more re-inforcement for those upon whom the burden of carrying out these changes will fall?

Technique of Research

It is significant that both Mayo and Hersey in their researches found it necessary to devise a technique for appraising the human factors in the industrial situations which they were studying. The need for developing this technique arose out of the fact that the usual explicit statement of a situation could not be taken at its face value, as it constituted more of rationalization than an accurate description or explanation. If an important machine breaks down, its condition can be reported accurately and explicitly, but if human difficulties arise, the explicit form in which they are given expression has little relation to the underlying causes.

In spite of many differences of method, the fundamental technique which both Mayo and Hersey used, was the individual conference in which the factor of status was not permitted to intervene. It is a consultative rather than an authoritative procedure, since the interviewer has no responsibility for discipline. This has suggested the possibilities of extending the uses of consultative techniques to supplement authoritative techniques as a tool of management as well as a tool of research.

Consultative Technique for Management

Of the many variations of the method, the one which seems to me valuable for this purpose is the use of a consultant for foremen or first-line supervisors to help them in dealing with the human problems for which they are responsible. The chief reason for having a special person to act as consultant is that it is extremely difficult for one person to combine the functions of consultation and the discharge of authority.

As industry is now set up, not only is the time of the higher executives completely absorbed with administrative activities, but there has been little opportunity for their systematic training. There are, of course, executives with skill in these matters acquired through long experience. But there are too few of them, and the other demands upon them are too heavy.

It is important that the person chosen as consultant should have a thorough knowledge of inter-personal relationships, and should, in addition, have the personality to inspire confidence. It is important too that he have practical and technical knowledge of the industry. This is the kind of position which requires knowledge and skill in two fields; personal relationships and the technique of production.

Criteria Applied to Consultant Plan

Let us consider how this plan might contribute to the stabilizing of human relationships in an industrial plant. First, the plan deals primarily with inter-personal relationships between members of the working group. Under this plan, the supervisor or foreman has an opportunity first to objectify these relationships as he sees

them and then to re-think the problems with the consultant, with less coloration of his personal bias. Since the consultant works with the foreman and not with the workers, the foreman surrenders none of his responsibility to the group, and the integrity of the group is strengthened.

Second, this plan discovers and utilizes the traditional and accepted code of the intimate working group. The consultant helps the foreman to formulate and understand the informal code of his group so that he can weigh and present the significant factors to his superiors. Here again, the consultant does not interfere with the responsibility of the foreman but helps him to discharge it more effectively.

The needs of workers are expressed in a code which is not explicit, but nevertheless is effective in governing their activities. It is important that managements learn what these traditions are so that they may be taken into account when company policies are being formed.

Third, this plan recognizes individual variations from the normal adjustment in the particular group, and suggests effective ways of dealing with them. A consultant can assist in the appraisal of the abilities and behavior of individual workers, help the foreman to devise ways of dealing with them so as to turn them to constructive use.

Analysis of an Actual Situation

A specific illustration may clarify some of these observations. The owners of a plant employing several thousand workers, manufacturing a product under mass production, were faced with continuing losses from operations. They decided logically to replace the works manager and his assistant with men from outside. They obtained two men who had successful records in the industry in another part of the country. This company was an old one in which, over a period of years, traditional personal relationships had become stable. The failure on the part of the new managers to understand these traditions and to provide a basis for new relationships to be formed, caused a serious disruption of morale which was sufficient to nullify the effect of their progressive methods. They were forceful and decisive and used to exerting considerable pressure upon their subordinates in order to secure the results they desired. They ruled with a firm hand and stated their requirements clearly and definitely, with the threat that if orders were not carried out, the subordinates would be replaced. Actually no arbitrary steps were taken, and no capricious use of power was ever made. But the subordinates responded with fear.

A study of the supervisors of one department, made over a period of eight months, shows how loss of morale operated to reduce productive efficiency. The department employed about three hundred men on a line production set-up. The quality of workmanship was controlled by supervisors because of the nature of the product. One hundred per cent inspection was impossible on an economic basis. However, if each man did his job and had the active support of his first-line supervisor in meeting difficulties due to variations in materials, a satisfactory quality could be maintained. The job of the first-line supervisor could be described as an active attention to the needs of his men, and a continuous check-up on them. The mechanical equipment was adequate; the variation in materials was a factor which could be compensated for; the organizational structure was suited to the work; the workers were trained and the supervisors understood their tasks. In fact, many other plants were known to be operating under less favorable conditions, but with better results. The only answer seemed to be "negligence," "carelessness," "lack of attention," on the part of the supervisors.

Partial Application of Consultative Plan

Now it was possible in this situation to utilize some features of the plan outlined before. The full implications of the plan were not understood at the time, and the use of the technique was not formally recognized. If it had been, it seems possible that the management might have profited by the insight which the consultant gained into the motivating forces behind the breakdown in morale.

The managers felt that an appeal to the reason of the workers through an educational program showing the results of defective quality would solve the problem. This may have been of some value, but undoubtedly it was the by-products of this program that were important.

The attitude of the director of this program, whom we shall refer to as the consultant, was impersonal. Facts were presented without bringing into question the status or the competence or the intelligence of those responsible. In addition, the supervisors had a chance to re-think their attitudes, to get rid of stored-up resentment by expressing their feelings to a listener who had no disciplinary power.

Different Responses to Insecurity

Some highlights in the personal relationships of the foreman and his five group leaders illustrate that the reasons for the breakdown in discipline lay in feelings of insecurity and fear of the management.

The foreman of the group expressed his insecurity in three ways.

(a) He sought escape from reality. He ignored the troubles of his supervisors, saying, "That's your job," when they came for help. He devised an ingenious hide-out where he could spend most of his time away from the work. The "grape-vine" always informed him when he should be on the job to "put on an act" for the boss.

(b) In his conversations with the consultant, he dwelt continuously on his activities outside the plant, his relations with women being a favorite topic. He dreamed of a business of his own. He said he didn't care if he was fired as he could always get a job from a relative of his who was a big official in another plant. These day-dreams were another means of escape.

(c) He developed a strong antagonism for one of his supervisors. He wished to replace him, but the supervisor's record in the plant was too good for this to be possible. This foreman tried to escape from reality, but felt guilty for failing in his own work, and so sought someone on whom he could shift the blame, and thus rationalize his own shortcomings.

One might think that this man was a poor foreman. Yet, under stable conditions, when he felt secure, he was aggressive and capable, and well liked by his men. The conduct described was the result of his insecurity when inter-personal relationships of long standing which supported his status in the plant were threatened. The fear of failure led him into destructive compensating activity, and undermined his power of leadership.

Group leader "A" reacted similarly. This man was called "punch-drunk" by his co-supervisors and his men. He was quiet, given to day-dreaming, and seemed to ignore what actually was going on.

Group leader "B" was of Italian parentage and was excitable. He felt the dislike of his superior, and tended to resent criticism of the work of his men as criticism of him personally. In defense he would enlarge upon his long service with the company to show how valuable he really was, though this might be quite irrelevant to the immediate discussion.

Group leader "C" was an inspector. He had had years of experience, was capable, yet had lapses when he would pass quantities of bad work, then be full of explanations. Though both large quantity and good quality were possible for him, he used "either, or" as a rationalization for his laxness. A curious trick of his was always, at closing time, to leave a satisfactory part on the top of the pile of work, in order, as he said, "to protect the boss."

Group leader "D" was a blusterer who was greatly liked and respected by his men. He would "stick up" for his men and got rid of his feelings of insecurity by bellowing purposelessly. In this case it did no harm because the bond between him and his men was strong. They expected him to yell and were amused rather than antagonized by it, because they could count on his backing them up.

Group leader "E" maintained a state of war with leader "D" which on the whole was not harmful. Since "E" received the work after "D," he was in a position to call "D's" attention to poor quality. "D" resented this loudly. "D" was a fairly good supervisor, and the rivalry between "D" and "E," being an accustomed relationship, tended to support the morale of both of them and to prevent them from becoming quite so indifferent as the others.

Group leader "F" was an inspector, a short fellow, who yelled at the others. He was apt to fight with the supervisors and try to assume authority over them. He lacked the respect of his workers because he was not content merely to inspect, but tried to show them how to do their job when he himself lacked their proficiency. He was trying to reassure himself of his status which he felt was threatened.

The threat to the stability of inter-personal relationships in the plant was behind this ineffective conduct. Because they feared the management, the supervisors were cut off from identifying with the aims of the management. They tended to hold on to what security they had, which they found by identifying themselves with their men. They followed the line of least resistance, and disregarded technical considerations rather than exert the discipline necessary to maintain the quality of the product. But their traditional code previously involved some loyalty to technical standards. Under the new management, these two loyalties were in acute conflict. When the educational program of the consultant was first undertaken, the loyalty to preserve the relationship with their men offered their only security and consequently overweighed the loyalty to technical standards which involved loyalty to a management they feared, but which offered them none of the support they needed.

Effect of the Consultative Program

After the program of the consultant had been in effect, the supervisors began to be reassured. Their fear of failure became less important. Over the course of the next five months noticeable improvement occurred, though there was fluctuation between confidence and fear. By the end of the period, the department had attained a fairly normal cohesiveness and unity, and the quality of the product had improved as a result of better supervision. It seemed as if a reasonably satisfactory resolution of the conflict between stability and progress had been attained in this department.

It is important to emphasize that the consultant was careful not to take over the rôle of the management, or the responsibilities of the supervisors, but bent his efforts to support the supervisors and foremen in the performance of their own jobs.

Criteria Applied to this Case

It should be clear from the foregoing that, while the inter-personal relationships were secor lary in the formal educational program, they were considered of primary importance by the consultant himself, and accordingly were given careful attention. The traditional and accepted code of the group with its technical standards, loyalty to management, and responsibility for leadership of the men, was recognized as under severe strain and efforts were made to re-establish it and then to develop it and give it new meaning. The different members of this supervisory group had individual reactions to a common difficult situation. The consultant had to help each man in a different way to overcome his fear and regain his status. This illustration cannot be regarded as a satisfactory experiment with the suggested plan because it did not have the formal support of the management and therefore could contribute nothing to their understanding of the situation. It does, however, show how these criteria may be applied in a particular situation. Other factors may be responsible for loss of morale under other circumstances, and might result in different sorts of behavior. But I am convinced that the use of consultative techniques would bring the real causes to light and help to alleviate them.

Training Engineers for Management and Business

(Continued from page 75)

programs are going to be retarded in getting public approval.

It has been declared that the programs are neither fish nor fowl—neither a good business course nor a good engineering course—and who can wonder when these programs have dipped into all engineering curricula, and cut across the entire field of business. But time and persistence on the part of some have moulded many of these administrative programs so that the student is given well-balanced and carefully selected portions of both engineering and business training. For example, the course in the theory of banking for engineers is now being replaced by practical business finance and accounting courses.

In the strictly technical engineering fields, special survey courses are being created specifically for the student who takes a combined engineering and business program. A special course in electrical machinery to show its use, purpose, and application is more satisfactory for this type of student than a series of specific courses in the elements of electrical engineering.

Conclusions

If management engineering courses and curricula are to have the recognition and professional standing that should be accorded to them, those interested in the field must bend every effort to ascertain and make indispensable the management courses that appear to be of most value as management options, as well as to determine what ought to constitute a well-rounded management engineering degree program. The time has arrived to cease experimenting and to undertake progressive work in the establishment of engineering management courses on a more satisfactory basis.

In the construction of curricula, moreover, care should be taken to stimulate a philosophy or point of view that will imbue the students with the broad social implications of management work. The problems of the worker and consumer, as well as those of governmental relations, press for attention perennially. Unless these are approached with an understanding of the principles and purposes underlying sound human relations, they will be viewed without proper illumination.

The Engineer and Human Values in Industry[1]

By P. M. RUSSELL

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The engineer today must consider that while a great deal of his work is with measurable elements to which he can apply the slide rule, he is also dealing with a vast, and as yet unmeasurable, element—human beings.

Engineering Training and the Human Factor in Industry

WE ENGINEERS, in so far as our regular college training went, were blessed. But we were handicapped, too. Blessed because our courses of studies, and the associated disciplines, created for us a high standard of performance as to accuracy and reliable method, and the recognition of a wide range of values based upon measurable quantities and phenomena. The strong influence of mathematics revealed itself in our clear and continuing allegiance to thoroughness and convincing demonstration. The disciplines imposed upon our mental processes by well-tested and accepted formulae and by the laws governing the behavior and properties of materials demanded that we be mentally honest if we would achieve any measure of recognition in the engineering field.

On the other hand, these very characteristics which distinguish engineering training and render engineers not only useful but indispensable in our modern industrial program, tended to handicap us by inducing a certain indifference to problems that were not wholly technical in nature. I wonder if there is a single one of us who in his individual development in industry, did not become so absorbed with responsibilities of a specific technical nature that he unconsciously over-rated the importance of the exact engineering aspects of business and under-rated the significance of many factors which were not susceptible of ready analysis and measurement. How long will it take us to realize that the most important of these non-measurable elements is that human entity we call an employe!

Events of the past four years have insistently brought this employe into a new spotlight of consideration, and it is still embarrassing to many of us to find that the problems associated with him are expressed in such a way that none of our mathematical formulae or vast information regarding materials and laws, and none of the highly developed techniques of measurement have any value whatsoever in dealing with him. We have recently become aware that the magnificent controls which can be applied to materials and to production processes are rendered valueless when a group of individuals decide to stop working and just sit down. The human factor in industry has with relative suddenness become a perplexing enigma for all levels of management, and many an engineer who has an excellent technical record, finds himself facing a new problem in human behavior—a problem which exhibits a great many unknown qualities, mentalities, skills and responses which are difficult enough to identify and much more difficult to analyze and appraise. It may be good engineering practice, however, to try to identify some of the characteristics of this human problem and to inquire into the manner in which the reactions of an employe or group of employes can either support or defeat the best laid plans which we, as engineers, may devise.

Natural Aptitudes and Production Costs

To begin with, the raw material as it comes to us is seldom classified in a useful way. It is decidedly opaque and we are unable to estimate what may be its coefficient of expansion or contraction. It does not come to us with a certification that will tell us its tensile or compression strength. We have no way of measuring its responses to the kind of group or supervisory magnetism which it may experience in a working field.

What does industry do in a case like this? It provides for an interview, it examines past school and work records, it asks a few rather personal questions, it may require a medical examination and finally, on the basis of a rather subjective appraisal, it places the respective samples of humanity in any one of a number of jobs with the reservation carefully expressed to the applicant that, "We'll give you a chance at this work for a

[1] Address before the Northern New Jersey Chapter of The Society for The Advancement of Management, March 11, 1937.

time and if you learn promptly and turn out a sufficient volume of work you can expect to make good progress." The applicant, if he accepts this opportunity, shortly finds himself drawn into a group, is trained in the respective steps of the required job; and then we rely on all manner of wage incentives and group standards of production to force him to fit into our employment pattern.

In the meantime, what about his natural aptitudes? Certainly the time-study man should be the first to admit the presence of specific but varied individual abilities. Some workers have a natural aptitude for manipulating forms and shapes, others have a gift for synchronizing their own motions with those of a mechanism, still others have an unusual ability in color values. Some of these humans are able to work to close tolerances of accuracy, and some have a marvelous, natural economy of effort. They all are likely to prove rather indifferent to some of the requirements in almost any type of work. Repetitive operations may be relatively comfortable for one worker and wholly intolerable to another. One may require the most careful instruction for relatively simple operations and then have to be re-instructed for every change in work requirements; another will have a sense of what it's all about and will adapt himself readily from one type of work to another. With these innumerable variations in the human material, it is inevitable that an individual's economic pressure on the one hand and industry's methods of selection and placement on the other, will result in the grouping of workers where the natural aptitudes and responses will vary from a high and fortunate fitness for the task all the way down to a relatively low and quite unfortunate adjustment to the required operations. It is true that careful supervision, supplemented by wage incentives and actual or implied threats, may force the poorly adjusted workers into a fairly satisfactory production, but the cost is high on the part of the employer, and without question, the poorly adjusted worker pays an inordinately high price personally in terms of excessive self-compulsion, and in accepting a lower production and earnings than the worker who is more happily synchronized with the job. The unfortunate part about the poorly adjusted worker is that he has little chance to explain his unhappiness to us nor is he likely to know enough either about himself or about the other jobs in our plant to help us in making a better job assignment. Many companies make a conscientious effort to overcome the more glaring difficulties of this sort through transfers to different groups, but the incompatibility between the worker and his job may not be marked enough to call for clear-cut, definite action but may be tolerated by a worker who hesitates to make trouble, not realizing that both the company and himself will inevitably pay an unfortunate premium for work done under such conditions.

Mental Attitudes and Production Costs

When a worker is forced by circumstances to adjust himself to unsympathetic processes and motions, the passing of time is sure to develop a conflict between the worker and his job. It makes little difference whether the compulsion is economic or a result of the methods of a given organization. In either case the strain of this conflict is absorbed in the mental and emotional areas of the worker. As interest in the work goes lower and lower, the burden on supervision becomes the greater in an effort to overcome the protective indifference of the employe. Under such conditions, irritations become magnified and lead frequently to a sense of discrimination. Not only lower production, but increased spoilage and accidents may result. The worker's situation, becoming less and less comfortable, is almost sure to set up corresponding stresses in his home and social atmosphere which in turn react unfavorably on his work attitude. Certainly costs of production under such conditions are bound to go up until the employe is finally fired.

What Makes Employes Dissatisfied?

Any degree of unfitness for a specific type of work is likely to produce dissatisfaction because the affected worker, under most wage plans, must pay a price in personal adjustment to maintain relatively good earnings. This situation is present in varying degrees with many individuals and it may be that they can arrive at an adjustment where the varying strains upon them may be kept at a constant so that no critical dislocation will occur. To the extent, however, that incompatibility does exist, such a situation may become a breeding ground for trouble.

Another source of dissatisfaction is any threat to a status already achieved. Individual employes or work groups will look with suspicion on new rules, procedures or technological changes which tend to break up groups who have become used to one another and who have established among themselves a satisfactory social relationship. Changes, unless explained in advance, open up possibilities of uncertainty which are usually unwel-

come to the workers. With every change, someone is likely to "lose out."

Employes become dissatisfied under any recurring irritants such as arise from faulty materials, ineffective equipment or poor planning. An unreasonable amount of physical discomfort likewise leads to dissatisfaction. Supervisory attitudes which include harsh rather than constructive criticism; or decisions which are arbitrary and, therefore, appear to be discriminatory, are likely to irritate the workers. Good industrial relations can scarcely survive if these irritations are allowed to persist.

Irregularity of work and earnings is another element which leads to dissatisfaction. The business of living entails many costs which go on day after day, and if the handling of these continuing obligations outside of work hours is rendered difficult by intermittent or irregular earnings, the employe is forced to wrestle with a problem *which grows out of his job*. Such a situation is not conducive to the kind of industrial relations we all hope to build up.

Fairness and unfairness appear to be important in affecting workers' attitudes toward an employer. A fertile source of impressions of unfairness may frequently be found in the wage differentials paid to respective groups of workers in a plant. A wage differential is bound to be interpreted by the workers as indicating either a difference in the value of two work operations or in the value of the performance as given by two groups of workers. In either case, if the lower-paid group is unconvinced of the validity of a differential, that group is likely to develop a persistent dissatisfaction. It is entirely possible that rates in the different parts of a plant will grow up over a period of years on a more or less arbitrary basis. Management may even take steps to find out that individual groups are relatively satisfied with the rates they are getting, respectively. The real difficulty may not lie in this attitude at all but may grow out of the inability of one group to see why another group should get one or two cents an hour more.

In contrast to dissatisfactions on a group basis one comes finally to the intensely personal matter of individual recognition and promotion. This factor is one of the most important of all in a well-designed personnel program. A worker has but one thing to sell and that is his work and the spirit with which it is done. He knows that his social position in a plant improves as his work is recognized by increasingly better jobs. We all, as individuals, work for and expect some recognition other than that which appears in the pay envelope. We have a natural desire for the outward evidences of progress. The lack of such evidences, especially in the earlier years of a worker's career, will almost surely create a dissatisfaction that no other combination of treatments can overcome. We are all thoroughly familiar with what the successive periods of unemployment and re-employment have done to the pride and confidence of thousands of workers during the depression and the net loss in self-respect and in mutual respect, resulting from the present lower status of many workers who previously had enjoyed some visible progress, is in no small measure responsible for today's unrest.

As a matter of fact, all the causes of dissatisfaction mentioned above have been operating concurrently during the depression, that is, unfitness for a specific job; frequent changes in the established status of individuals and groups; irritations resulting from various measures of economy and pressure for production; irregularity of earnings; increased sensitiveness to differentials (especially when wage scales were cut lower and lower); and the lack of promotion and progress. We cannot wonder, therefore, that industrial relations have suffered under the burden of these accumulated dissatisfactions. It would hardly be fair to lay the blame for all this at the door of the personnel director, or the production executives, or the sales department, or the top management. Perhaps this situation will help us to realize that the *re-building* of better employe relations is likewise not the job of any one individual in an organization. Certainly the wise management will see to it that every branch and level of supervision will join in this re-building process under conditions where the obligation to help build shall extend to, and continue to rest on, many shoulders. Nothing short of a company-wide personnel program can meet the challenge of today's needs. Careful thought and unremitting effort must be made, starting with the policy-making group of executives, to remedy and, if possible, eliminate the causes of dissatisfaction among workers.

Recent Developments in Personnel Practices

The foregoing discussion has dealt at some length with the many intimate human aspects of industry because the actual recent developments in personnel practices would have little meaning unless appraised in the light of such underlying conditions. The recent liberalizing of both wage schedules and personnel practices

represents many different stages of progress toward better industrial relations.

The deflationary pressures during the depression eliminated many personnel practices which had previously been wholly justified but which simply cost too much to be reconciled with depression management. Similarly, wage and salary cuts had affected almost the entire working population.

Most of the more recent developments have been in the nature of restorations toward a status which had previously existed. Perhaps the most important single change in the thinking of both workers and employers has been a realization of the necessity of considering every individual in the country in his capacity as a consumer. The older economic conception of demand with regard to goods and services has become personalized. Every worker in the country, no matter how lowly his position, is today a conscious and articulate element of this demand. The obligation to provide a reasonable degree of social security is no longer confined to a few private charities and an almshouse, nor can this obligation be fully met by social legislation. Some part of this obligation for security has been allocated unquestionably to industry itself, and in a measure which is bound to exceed all our earlier ideas on the subject. Whether we are prepared for it or not, industry must draw up a new set of working drawings which will enlarge the dimensions of our personnel programs so that the human materials involved in our businesses will receive just as careful thought and planning as we have been used to giving to our inventories of raw and finished goods, to our sales research, technological developments and to the administration of our finances.

The more general changes have included horizontal wage and salary increases for all employes of a company, profit-sharing formulae which include workers from the doorman to the president, cost-of-living supplements which apply to both hourly and salary workers alike and, as instances of willingness to reward faithful effort, many companies distributed fairly substantial bonuses to all their employes at the end of 1936. Over these general methods of improving the outlook for employes there have been a number of developments which were of a selective or differential nature.

Wage increases in many instances have been made on a graduated percentage basis with the higher percentage applying to the lower-paid groups. I hope the use of this device received careful thought because increases thus graduated result in a narrowing of the relative range from the lowest paid classification to the highest paid job. Any narrowing of this range tends to squeeze the intermediate differentials rendering them more difficult to explain or defend and, consequently, making them less satisfactory to workers in the intermediate job classifications.

Overtime rates have been liberalized gradually and are likely to become a more important element in production costs during peak periods. Some companies are already committed to paying time and a half for any work on Saturday. Vacations with pay for hourly-rated employes are certain to come in for more active consideration in the near future. Vacations with pay for salaried workers have been well established and their absence among hourly-paid workers has constituted a practice which for years has been looked on by the factory crowd as an unreasonable differential. The real point is, that factory workers look on the question as one of social distinctions, which they resent.

Payment for holidays not worked is another of these differentials which set the factory employes on a less desirable social level than the office employes. This distinction may have to be eliminated in the course of time.

The greater independence of employe groups, whether tightly or loosely organized, has brought many managements to the conclusion that it will be wiser in the future to discuss with employes or their representatives, more frankly the various changes of a technological nature which affect the interests of the employes. Programs of "co-operative dealing" with employes may have many advantages which cannot be present in the more hostile atmosphere of collective bargaining.

These are some of the more recent developments, but I believe that the most important development of all is the renewed consciousness that every supervisor and executive is individually responsible for better employe relations, and that every one of us who would keep abreast of the times must accept this responsibility and pay the price in personal effort and study to learn what this new part of our job is. Today you will find no complete, authoritative hand-book on the principles of progressive employe relations. We need one badly, but there is no easy formula. The one short-cut to better industrial relations is to humanize our attitudes,—to realize that our personal advantage over the man on the bench is largely due to the accidents of heritage, of education, of social contacts, of culture and to measures of will and self-discipline which in large degree spring from those same accidents. Having first made such a

(Continued on page 96)

Applied Scientific Management[1]

XII. Organization—Functions of the Comptroller's Department

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Our discussion of the function of the General Manager in the third article of this series (Bulletin of the Taylor Society, Vol. XVIII, No. 1) led naturally into a discussion of various reports, and of accounting and budgeting, considered as tools essential to the effective performance of his duties.

At that time I stated that the functions of the major executives reporting to the General Manager would be discussed in due course. The time for this seems to have arrived.

FOR an industrial establishment of average size doing an annual business of, let us say, from a minimum of one million to a maximum of ten million, our major departmental organization would be set up about as follows:

Plan of Organization

There would be the following primary divisions of the business, each under a major executive as indicated:

Department	Executive Title
A & D—Manufacturing Departments including *Auxiliary*	Work Manager
B. Business Departments	
BA—Auditing Department	Auditor
BC—Comptroller's Department	Comptroller
BP—Purchasing Department	Director of Purchases
BT—Traffic and Shipping Department	Traffic Manager
C. Sales Department	Sales Manager
E. Research and Development	Director of Research

The heads of these departments would report to and be responsible to the General Manager who would provide the necessary co-ordination and liaison between them. Each of the primary departments would be subdivided along the lines indicated further on.

It will be noted that I have used functional designations for the executives heading these departments rather than those of corporate officials. Apart from signing certain documents, strictly speaking, the latter, with perhaps the exception of the Treasurer, have no place in the operating picture. I have known cases in which the General Manager held no elective office in the company and yet operated with full authority over all activities. In others, the individual holding the corporate office of Treasurer held the position of General Manager. Many companies have Presidents who (excepting as they may, through the board of directors, influence policies and plans, or in discussion with the General Manager, impart helpful criticism or advice) take no part in the actual running of the business. However, the use of the corporate titles in conjunction with major executive functions may serve an important purpose by way of "window dressing"—and there is no objection to this so long as the responsibilities and authority pertaining to the functions concerned are not affected one way or the other. In such cases the titles might be stated: President (or Vice-President) and General Manager; the Works Manager as Vice-President in Charge of Manufacturing (or Plant Operation); Vice-President in Charge of Sales or Secretary and Sales Manager; Secretary and Comptroller, etc.

Comptroller's Department

By reason of the dependence of the General Manager upon the information furnished him by the Comptroller and because the latter's work extends into and affects virtually every one of the company's activities, and, in view of our having gone into the subjects of accounting and budgetary control, it seems logical to take up the functions of the Comptroller's department at this point. This does not mean, however, that it necessarily outranks in importance any of the other major executives who are directly responsible to the General Manager.

In the early literature of Scientific Management (either published or unpublished), one may find no reference to the Comptroller. One does, however, find plenty of reference to the activities which are today grouped and placed under his jurisdiction. These activities were either combined with other major func-

[1] This is the twelfth in the series of articles on "Applied Scientific Management" which began in the October, 1932, issue of the *Bulletin of the Taylor Society*.

tions, to which they were more or less related, or were treated independently as falling directly within the jurisdiction of the General Manager. In what is probably the best description of the activities included in a Comptroller's department [2] we find the statement: "The present position of the Comptroller in business organizations has developed as an outgrowth of the auditing function. During the past twenty years, or since the enactment of the Federal Income Tax Law, there has been a gradual evolution of the Comptroller's responsibilities. . . . Many variations are to be found in the functions assigned to the Comptroller."

The report above referred to was prepared with the co-operation of the Comptrollers Institute of America, which organization advocates the election of the Comptroller as an officer of the Corporation by the Board of Directors. It also advises against the office of Treasurer being held by the individual serving as Comptroller. This accords with the principle, enunciated in Taylor's early writings, that one individual or department should not have sole authority over specifications, purchases, acceptance of goods, approval of invoices for payment, accounting in regard thereto, and payment. While in the main the functions of the Comptroller's department, as I have outlined them, are in accord with the Metropolitan Life Insurance Company's report, it will be noted that I have made Auditing an independent major function, responsible directly to the General Manager, whereas the report treats it as a function of the Comptroller's department. In doing this I have followed the original lines laid out by Taylor.

There may be some question as to whether or not the function of the Cashier, in which I include receipt, deposit and disbursement of funds, should be placed in the Comptroller's department. I have, however, so placed it, having in mind the fact that no disbursements may be made without the independent check and approval of the auditor. Nevertheless, there are authorities who take the stand—and with some logic—that the responsibility for accounting for indebtedness either of the company to its creditors or of its debtors to the company, and for the receipt and disbursement of funds should not come under one person or department. If this viewpoint is held we may set up the Cashier's function on the plane of a major department, making it directly responsible to the Treasurer. The nature of the business, its size and financial structure should have considerable weight in deciding this point. In the average business the individual serving as Treasurer will usually occupy one of the major executive positions which will take up the greater part of his time while duties of his corporate office will require very little. The latter should include, in addition, the signing of various documents as required by law or the company's by-laws, such things as arranging for bank loans, investment of surplus funds, deciding upon depositories and the amounts to be carried therein and other major matters related to the company's finances which in the main are not in the nature of the routine operation of the company's business.

In this connection the method of handling receipts and disbursements advocated by Taylor may well be kept in mind. This was briefly referred to in the fifth chapter of this series on page 56, item 2e, Vol. XVIII, No. 3, *Bulletin of the Taylor Society.*

Outline of Organization and Classification of Functions of Comptroller's Department

DIVISIONS	EXECUTIVE TITLE
BCA—Accounting and Statistical Division (General and Cost)	Chief Accountant
BCB—Budgetary Control Division	Chief of Budget Division
BCC—Cashier's Division	Cashier
BCG—General Office Function Division	Office Manager
BCK—Credit Division	Credit Manager
BCL—Billing and Order Division	Chief of Billing and Order Division
BCN—Insurance and Tax Division	Chief of Insurance and Tax Division
BCP—Payroll and Timekeeping Division	Paymaster
BCR—Price Control Division	Chief of Price Control Division

The functions of each of these divisions are outlined in the following:

BCA—Accounting and Statistical Division—Executive in Charge: Chief Accountant

This division will include the following sections, the functions of which will be discussed on following pages:

BCAA—General Accounting Section.
BCAC—Cost Section.
BCAS—Statistical Section.
BCAT—Accounts Receivable and Payable Section.

BCAA—General Accounting Section

The functions of this section would include the keeping of all general books, the preparation of the General Ledger Balance Sheets and Profit and Loss Statements.

[2] "Functions of the Comptroller," a report published by the Policyholders Service Bureau, Metropolitan Life Insurance Company, 1935.

In this it would utilize figures supplied by the other sections of the Accounting and Statistical Division as well as by other divisions of the Comptroller's department.

This section would maintain any special records, and prepare any special reports, particularly those of a confidential nature as might be required by the Comptroller.

BCAC—Cost Section

This section would be responsible for all cost accounting with respect to products, equipment, and indirect expenses, and for the distribution of indirect expenses to products. It would prepare the periodic comparative expense statements and would supply to the general accounting division figures for posting to the general books and for the preparation of current financial statements.

BCAS—Statistical Section

This section compiles and tabulates statistics with respect to sales, expenses, costs, etc., for the benefit of the various departments of the business and for other divisions of the Comptroller's department or other sections of the Accounting and Statistical Division. It co-operates in the preparation of financial and other operating reports and statements.

BCAT—Accounts Receivable and Payable Section

As its name implies, this section would keep the books pertaining to customers and vendors with whom we do business. It prepares and sends out statements to customers.

BCC—Cashier's Division—Executive in charge: Cashier

This division would handle all work in connection with cash transactions except postings to Accounts Payable and Receivable. Its work would include:

a. Postings to cash books.
b. Making deposits.
c. Making disbursements authorized by audited vouchers including payrolls.
d. Handling petty cash.
e. Any special duties assigned by the Comptroller.

The cashier would have his own bank account or accounts from which the greater part of all disbursements would be made upon his signature. His funds would be replenished at intervals from the Treasurer's bank account in which *all* receipts would be deposited.

BCG—General Office Functions Division—Executive in Charge: Office Manager

The functions embraced by this division would include:

1. Office Management.
   a. Utilization of office space and office arrangement.
   b. Office furniture and other equipment—provision, replacement, and upkeep.
   c. Provision of office supplies.
   d. Maintenance of good working conditions with respect to heating, ventilation, cleanliness, and orderliness.
   e. Personnel matters: Supervision over selection, training and advancement of office employes. Dealing with problems which may arise, requiring disciplinary action such as friction between employes, insubordination, inefficiency, etc. Salary increases or adjustments.
2. Central office file section.
3. General stenographic and clerical section.
4. Mail Section.
5. Telephone, telegraph, and messenger service.
6. Establishment and maintenance of standard practices and development of methods for the performance of office work and of periodic reports of actual performance compared with standards.

BCK—Credit Division—Executive in Charge: Credit Manager

This division would handle all matters in connection with extension of credit and collections.

BCL—Billing and Order Division—Executive in Charge: Chief of Billing and Order Division

This division would be responsible for the typing, checking, and distribution of all orders received from customers and for any records pertaining thereto up to time of shipment. It would serve as liaison between the Sales Department and other departments in following up or expediting shipments and bringing any delays to the attention of the proper parties. It would be responsible for the typing, checking, and distribution of invoices for goods shipped.

BCN—Insurance and Tax Division—Executive in Charge: Chief of Insurance and Tax Division

It would be the duty of the person in charge of this division to keep informed of all tax laws and requirements relating to the business and to maintain necessary

records and files of data pertaining thereto. He would prepare or supervise preparation of all reports required for tax purposes and conduct all routine dealings in relation to taxes with governmental representatives or offices.

He would keep informed and maintain records in all matters relating to the company's insurance and handle all routine business with representatives of the insurance companies or other agencies concerned.

BCP—Payroll and Timekeeping Division—Executive in Charge: Paymaster

This division would be responsible for all timekeeping and preparation of payrolls for all departments. It would also compile employe's records of attendance, efficiency and advancement.

Payrolls would pass from this division to the Auditor for check and approval and then to the Cashier for payment.

Inasmuch as workers job-time cards also serve the purpose of cost-keeping, there must be proper co-ordination with the cost-keeping section. Certain details of the timekeeping system developed by Taylor will be discussed further on in this chapter.

BCR—Price Control Division—Executive in Charge: Chief of Price Control Division

All proposals for changes in list selling prices other than those governed by an approved standing order, as in the case of those based upon market price of raw materials, would pass through this division for review. The person in charge of this function would secure and collect information in regard to each proposal, covering for each item of product concerned:

a. Quantity sold.
b. Number of sales.
c. Classes of customers to whom sold, and quantities bought by each.
d. Amounts sold in dollars.
e. Source of material.
f. Actual costs—material, labor, indirect.
g. Character of competition.
h. Potential market.

This information with the recommendations of the Price Control Division would be submitted to the Comptroller who would recommend the proposed change, or if in doubt, discuss the matter with the Sales Manager, the General Manager, or other parties concerned, with a view to reaching a proper decision as to what action should be taken.

Broadly speaking, the objective of this division would be to guard against unwise changes being made, either up or down, in the absence of complete knowledge of all factors which should be considered.

At intervals this division would also review standing orders governing routine price changes with a view to their modification in accordance with changing conditions.

In every instance a proposal for change in price should state the reason for changing.

In the case of new products a similar procedure would be followed in establishing the prices at which they are to be sold.

Certain Details of the Taylor Timekeeping Plan

In the sixth installment of this series on Page 7, Vol. XIX, No. 1, *Bulletin of the Taylor Society,* brief reference was made to the use of "job-time cards" in compiling the factory payroll previously to their use for cost purposes. In the use of workers' time cards as developed by Taylor, we have a good illustration of his practice of making primary original documents serve a number of distinct, though related, purposes. These are:

a. Timekeeping.
b. Payroll entry.
c. Cost keeping.
d. Recording progress of work and controlling its progression through the plant.

The Taylor method of timekeeping is an outstanding example of effectiveness and simplicity and in a plant operated under Scientific Management offers many advantages over what may be regarded as more up-to-date systems.

To start with it requires that all workers in a plant or given department thereof shall use a single special entrance when coming to work or leaving the plant. On the wall of this entrance are time-card racks (similar to those now used with certain "time-clock" systems) providing "pockets" each marked with a workman's payroll number. These pockets are of a size to hold a standard time card and to permit its easy insertion or withdrawal. The door to this entrance is opened a suitable time in advance of the hour for starting work; the passage is of a width suitable for single file entry. (There may be, of course, in the case of a large plant, a number of such passages in order to avoid congestion). As each employe passes the rack he takes his time card from the pocket bearing his payroll number and goes to his machine or workplace in the plant. The

time cards filled out to show his payroll number and the job on which he is to start, or, as the case may be, to continue, stamped with the regular starting time, were prepared and placed in the rack by the timekeeper after quitting time the day before. No separate time-clock card is necessary, as will be seen later and all cards bear a *uniform* starting time which avoids confusion resulting from cards being stamped with the actual hour and minute of entering the plant.

As employes enter, a timekeeper is present, it being his duty to see that each person takes only his own card from the rack—or at least that *only one card* is taken. If by accident or design a card other than the correct one were taken, it would be detected when the employe turned it in on completion of the job or at the end of the day.

When the starting time whistle blows, the timekeeper closes the entrance, removes any time cards remaining in the rack, stamps them "EMPLOYE NOT IN ON TIME" and sends them to the order-of-work clerk who puts a card on the Planning Department "Bulletin Board" for the machine or workplace concerned, to indicate that it is idle because the operator is not in. The time card is then sent to the payroll clerk.

An employe arriving late comes in through another entrance at which he signs a slip reading: "I arrived in the works at (time)." This slip he takes to the time card changing window in the Planning Department where he receives a time card for the job on which he is to work, stamped with the time of issue—which closely coincides with the time of his arrival in the works. The slip showing the time of arrival is then sent to the payroll clerk.

During the day as a worker finishes one job, he signs and turns in his time card which is stamped with the "time finished" and receives a card for his next job on which the same time is stamped as "time started." All time cards for jobs finished during the day are, after having served the purposes of the Planning Department, sent to the payroll clerk.

At quitting time the procedure is reversed. Each employe, as he leaves, places the time card for the job upon which he was working when the whistle blew, in the pocket in the time-card rack bearing his number. Each card has been marked "finished" or "not finished" and signed by the worker. It is the timekeeper's duty to be present and to see that no employe places more than his own card in the rack.

After allowing a reasonable time for all employes to go out, the exit is closed and the timekeeper removes all time cards from the rack, making a note of any pockets not containing a time card. He then stamps all cards taken from the rack with the regular quitting time. For all jobs marked "not finished," he prepares a new card for the next day. In the case of jobs which chance to have been finished as the day ended, he procures from the recording clerk the card, which was prepared in advance as a part of the planning, for the next job scheduled for the machine or workplace to which the employe is assigned. He then stamps the next day's time cards with the date and starting time and places them in the rack. The time cards which he removed from the rack at quitting time are then transmitted to the payroll clerk.

In the case of a worker leaving the plant before quitting time, he signs a slip as he goes out reading: "I left the plant at (time)." This slip is also sent to the payroll clerk.

In his original timekeeping plan, Taylor provided a further check; that of having a timekeeper visit each department or shop and check off against a list the employes present. This was done once during the forenoon and once during the afternoon each day. The timekeeper signed these lists under the statement: "I have personally seen the employes whose names I have checked above." He also made a written report with respect to employes whom he had failed to see. These reports went to the payroll clerk.[3]

Each morning all job-time cards from the day before, together with the various slips mentioned indicating late arrival, early leaving or absence, are sorted by the payroll numbers. For this sorting Taylor introduced an ingenious arrangement of trays—each providing several hundred compartments of suitable size to receive time cards and on such an angle as to facilitate rapid sorting. These trays were suspended from the ceiling in such a manner that they could be swung down over a standard Planning Department desk for use. The compartments of one or more of these trays were numbered to correspond with payroll numbers. After all cards had been sorted, bringing together those for each employe, the payroll clerk had only to see, in a majority of cases, that the employe's job-time cards accounted for a full day. Even before my becoming identified with Scientific Management, Taylor and his associates used a decimal system of "timekeeping," the clocks being arranged to indicate tenths and hundredths of hours instead of minutes. The day's working time started at

[3] There no doubt are certain situations in which this extra check may be desirable or necessary. I have not, however, had occasion to use it in my own practice.

zero and time during the lunch period was blank. For example, in a plant starting at eight A.M., with a lunch period of forty-five minutes from noon to 12:45 and closing at 4:45 P.M., the clock readings would be:

Starting time	8 A.M.	0:00
Lunch period ..	Noon	4:00
	12:45 P.M.	4:00
Closing time	4:45 P.M.	8:00

Thus the clocks at any time during the day gave a direct indication of the elapsed working time since starting time in the morning. On job-time cards the "time finished" is stamped or written above the "time started" which simplifies determination of the time spent on the job. In the case of a worker who reported on time and worked the full day, it is only necessary for the payroll clerk to see that the first card started with zero, that the last finished with eight and that the starting time of each succeeding card is the same as the time finished on its predecessor. This being so he enters eight hours on the payroll to the credit of the employe. In the case of an individual who was late or who left early, he checks the time reported by the worker with the starting time on the first time card, or the time finished on the last, as may be appropriate, and enters the actual hours worked on the payroll. Bonus, premium, or piece-work earnings are entered separately. At the end of the week, the total hours to be paid for at the employe's hourly rates, are extended and the amount entered. To this the amount of bonus or other extra pay is added and the total entered. The payroll would then go to the Auditor, and, if approved, given a voucher number, registered to the credit of "payroll" in the Register of Accounts Payable and then go to the Cashier for payment.

Naturally, today in a sufficiently large company, we should use the tabulating machine for sorting job-time cards both for payroll and cost purposes, but for many smaller concerns the sorting trays referred to might better serve the purpose. The sorting device was, if memory serves me right, designed by Mr. Carl Barth and was picturesquely called "the flying machine."

Conclusion

At best the Comptroller's job is a difficult one. It calls for an unusual combination of forcefulness, tact, and perseverance. His effectiveness in the last analysis depends upon the establishment of confidence in the soundness of the facts that he presents, in his interpretation of those facts and in his recommendations.

He must largely depend upon the acceptance of his findings by the General Manager and upon the latter's authority for their being carried out in practice. The General Manager should, as reports and recommendations are received from the Comptroller, hold conferences with the major executive concerned, at which the Comptroller sits in. In turn it is desirable that the department heads hold conferences with their principle subordinates to which the Comptroller is invited. From the Metropolitan Life Insurance Company report I quote: "The importance played by the comptroller in the scheme of things depends solely upon himself. He can be one of the major executives, one upon whom the executives lean and in whom they have the utmost confidence. Or he can be little more than a glorified bookkeeper."

When we consider the variety of subjects with which the Comptroller's department is required to deal, we are reminded of Taylor's analysis of the duties of a foreman under the old style of shop management and the value of functional organization becomes apparent. The variety of what might be termed technical knowledge necessary, impresses us with the importance of having each of the functional sections headed by a properly qualified person. And this brings us back to what Taylor defined as the second of the four basic principles of Scientific Management: the scientific selection and training of the worker. The Comptroller should endeavor to develop his principal subordinates to the point where each may be regarded as an authority in his line and know more about it than anyone else in the organization.

"In concluding let me say that we are now but on the threshold of the coming era of true co-operation. The time is fast going by for the great personal or individual achievement of any one man standing alone and without the help of those around him. And the time is coming when all great things will be done by the co-operation of many men in which each man performs that function for which he is best suited, each man preserves his own individuality and is supreme in his particular function, and each man at the same time loses none of his originality and proper personal initiative, and yet is controlled by and must work harmoniously with many other men."—Frederick W. Taylor.

ADMINISTRATIVE AND INDUSTRIAL ENGINEERING STUDIES IN COLLEGE AND UNIVERSITY CURRICULA

Results of a Survey Made by the Committee on Education, Hugo Diemer, Vice-President in Charge of Education, Chairman

In October, 1930, The Society of Industrial Engineers published a report on the above subject which presented the situation as it existed at that time.

In 1936, after the consolidation of the Taylor Society and The Society of Industrial Engineers into The Society for the Advancement of Management, a new educational committee, with the same chairman, made a re-survey of the situation. This survey included not only the institutions which had answered our original questionnaire, but all other institutions whose catalogs indicated that they were giving some type of training in management.

Colleges Offering a Distinct Curriculum in Industrial Engineering, Industrial Management, or Industrial Administration

The 1936 re-survey disclosed that the depression years added seven additional institutions offering such a curriculum, and that only two institutions had discontinued it. The total number of institutions offering such a curriculum and degree in 1936 is thirty-one as against twenty-six in 1931. Following are the institutions which, in 1936, offered a distinct curriculum:

A. Institutions offering a distinct degree as well as a distinct curriculum: [1]

University of Akron (Ohio).
University of Alabama.
Carnegie Institute of Technology (Pa.).
Lafayette College (Pa.).
Lehigh University (Pa.).
Manhattan College (N. Y.).
Miami University (Ohio).
Montana State College.
Northeastern University (Mass.).
Ohio State University.
Oklahoma A. & M. College.
Oregon State College.
Pennsylvania State College.
Pratt Institute (N. Y.).
Texas Technological College.
University of Pittsburgh (Pa.).
Virginia Polytechnic Inst.
Total of this group, 17.

B. Institutions offering a distinct curriculum, but giving a general degree: [1]

Columbia University (N. Y.).
Cornell University (N. Y.).
University of Detroit.
University of Florida.
University of Iowa.
University of Michigan.
North Carolina State College.
University of North Dakota.
Purdue University (Ind.).
Rensselaer Polytechnic Inst. (N. Y.).
Syracuse University (N. Y.).
Yale University (Conn.)
New York University.
Washington Univ. (Mo.).
Total of this group, 14.
Total of both groups (A. and B.), 31.

[1] Engineering Schools only; for others see "G."

C. The following institutions reported that, although they have no organized curriculum in Industrial Engineering or Industrial Management, they have a department which acts as a service department and in which subjects or courses are taken by students in the various engineering curricula to a varying extent:

Alabama Polytechnic Institute.
Armour Institute.
Harvard University Business School.
Mississippi A. & M. College.
University of Nebraska.
New Mexico A. & M. College.
Newark College of Engineering.
Princeton University.
Rhode Island State College.
Rutgers University.
University of Utah.
University of West Virginia.
University of Wisconsin.
University of Wyoming.
Number of institutions in this group, 13.

D. Most prevalent or predominant subjects in Industrial Engineering curricula other than engineering fundamentals common to all other engineering curricula. Listed in order of frequency these are:

1. Industrial Organization, Industrial Management, or Factory Organization and Administration.
2. Personnel Management, Industrial Relations, or Human Relations.
3. Plant and Shop Lay-out and Design.*
4. Cost Accounting or Industrial Accounting.*
5. Production Planning or Producition Control.
6. Time and Motion Study.*
7. Shop Methods or Methods Engineering.*
8. Tool Design.*

* Usually accompanied by work in laboratory, drafting room, or surveys.

The above subjects appear in the majority of curricula in Industrial Engineering. They are representative of what the majority of institutions considers essential.

E. Other Management subjects taught. The list of subjects offered in the Management field as electives, and in some cases as required subjects, is as follows:

Budgetary Control.
Business Policy.
Business and Government.
Business Law.
Case Analyses.
Corporation Finance.

Distribution Methods.
Financial Organization and Management.
Foreman Training.
Inspection.
Job Analysis.
Material Handling.
Production Machinery.
Purchasing and Inventory Control.
Plant Visits.
Scientific Management.
Standardization and Simplification.
Specifications.
Trade Analysis.
Transportation.
Traffic Management.

It is quite obvious that most of the above are specialties which can be treated in the content matter of the most predominant courses listed in "D."

F. Use of the term Engineering Economics or Economics and Administration. Notwithstanding the increase in the number of curricula in Industrial Engineering and departments of Industrial Engineering, there is apparent in certain institutions, and among certain deans active in the so-called four "founder societies" (namely, the Civil, Mechanical, Mining, and Electrical Engineers), a reticence in recognizing the term "Industrial Engineering." Also, in some institutions, there is a tendency to pass over the instruction in these subjects to economists rather than engineers.

The Society for Promotion of Engineering Education, realizing the need of all engineers to get training in some of these branches, has established a committee on Economics and Administration and has conducted several summer conferences under the heading of "Engineering Economics," where a good many of the subjects we have listed are discussed. However, the practical outcome thus far has resulted usually in only about two general survey courses being taught in the older engineering curricula: one in General Economics, and one usually being designated as Engineering Economics, in which cost finding and accounting is stressed in the particular field of engineering involved.

While it is very desirable that all engineers become better grounded in fundamental and applied economics, such instruction is in no way a substitute for an organized curriculum in Industrial Engineering or Industrial Management.

G. Colleges other than Engineering offering Management curricula. The following institutions offer in their colleges or departments of Commerce or Business Administration, organized curricula in Industrial Management or Industrial Administration:

University of Arkansas.
Brigham Young University (Utah).
Emory University.
General Motors Institute of Technology.
Harvard Business School.
University of Illinois, College of Commerce.
Miami University (Ohio).
University of Minnesota, College of Business.
New York University School of Commerce.
University of North Carolina.
Northwestern University (Ill.).
Ohio State University, College of Bus. Adm.
Ohio Wesleyan University.
Stanford University (Calif.).
University of Tennessee.
Tuck School of Dartmouth College (N. H.).
Tufts College (Mass.).
Utah State College.
University of Washington (Wash.).
Wharton School of Finance and Commerce (Pa.).

Total number in above group, 20.

H. Most predominant studies in curricula in colleges in Group G. These are as follows:

General Economics.
Labor Problems.
Personnel Management.
Industrial Organization and Management.
Theory of Accounts.
Higher Accountancy.
Cost Accounting.

It is obvious that the curricula in Industrial Engineering contain subjects adapted to the requirements of Production Management combined with engineering fundamentals, whereas the curricula in Group H, especially if followed by a fifth year of specialization, more nearly meet the requirements of the management groups which are co-operating with the engineering societies in the jointly sponsored programs of the Management Councils in Boston, New York, and Chicago. These organizations include: the American Marketing Society, the Office Management Association, the Econometric and the American Statistical Association, the National Federation of Sales Executives, the local Industrial Relations Associations, the Personnel Research Federation, the National Association of Cost Accountants, and the Association of Consulting Management Engineers. These organizations represent the major employment prospects for college graduates in management outside of the Industrial Engineering field.

I. Conference of Teachers of Management. These conferences in the past, as sponsored by the Taylor Society and The Society of Industrial Engineers, have afforded a splendid opportunity for an open forum in which educators can get acquainted and find out the objectives and policies followed in the various institutions.

Your Committee on Education recommends the continuance of these conferences of Teachers of Management as a feature of the conventions of The Society for the Advancement of Management.

Additional copies of this report may be obtained from HUGO DIEMER, Vice-President in Charge of Education, The Society for the Advancement of Management, 4101 S. Michigan Ave., Chicago, Ill.

REVIEWS

The Burden of Plenty? By Hon. R. H. Brand, Hugh Dalton, H. D. Henderson, J. A. Hobson, Graham Hutton, A. R. Orage, Prof. Lionel Robbins, Sir Arthur Salter, Mrs. Barbara Wootton, George Allen & Unwin, Ltd., London, 1935, pages 155. (4s. 6d. net)

The Burden of Plenty is a symposium centering around the query, "In what does the economic problem consist?" Here is reproduced with little change twelve radio addresses delivered over the British Broadcasting System by some of England's most noted economists and statesmen. Those speaking were the Hon. R. H. Brand, Hugh Dalton, H. D. Henderson, John A. Hobson, A. R. Orage, Lionel Robbins, Sir Arthur Salter, Barbara Wootton and the Editor, Graham Hutton.[1]

The speakers are to be highly complimented for their success in analyzing difficult and technical economic problems, and at the same time in making themselves understood by the average radio listener. Great interest in the talks was taken by the British people as the following incident shows. During the period covered by the talks, a lady called up the Editor, Mr. Hutton, and said, "We have been hearing a great deal lately about the law of supply and demand. Can you tell us the date when that law was passed?"

In "placing the field" the editor says that the title "The Burden of Plenty" describes the striking contrast between poverty, unemployment and low standards of living on the one hand, and the destruction of goods which, so many people think have been overproduced, on the other. Now, have these goods been destroyed by evil-minded men to prevent those who need them from getting them? Or have these goods been unwisely produced, so that too many goods were offered at too high prices? (p. 17)

H. D. Henderson dealt, primarily, with the problem of growth and technological unemployment. He recalls the famous Luddites who organized one hundred and twenty years ago to destroy the machines that were robbing men of employment. Yet history has shown that employment has increased faster than the population, that except for temporary and transitional unemployment, which is a serious problem, machines and other labor-saving devices have increased employment, and vastly improved the standard of living for everyone, including the laboring man. He then poses the query, "Has anything happened to make what was true in the nineteenth century untrue in the twentieth?" The one new factor now operating is a rather sudden and rapid decline in birth rate and population increase. "Increasing productivity and declining numbers, taken together, will make an economic world in many ways more unstable than that of the pre-war years."

Hugh Dalton names five "present discontents." They are poverty, insecurity, inequality, lack of freedom, and the fear of war. Those familiar with the thought of Dalton will know that his major remedy for these problems is *planning*. "I am for economic and social planning, both on a national scale and internationally. . . . I believe that all the evils I have been describing are largely due to lack of sensible planning." (p. 41)

John A. Hobson spoke on "Underconsumption and its Remedies." He presented in brief compass his general theory of *oversaving*. Underconsumption is not due to lack of purchasing power, but to a maldistribution of purchasing power. Too much of the annual income goes to those who reinvest their savings in capital goods. "Trade must be kept profitable and excessive savings and investments make it unprofitable. Thus excessive savings are seen to be the cause of unemployment and depression. It is only another way of saying there is underconsumption." (p. 50) The remedy for underconsumption and unemployment is a proper *proportion* between saving and spending.

A. R. Orage spoke on "Social Credit" but contributes little to the solution of the economic problem, the reviewer believes, because of a fundamental misunderstanding of the theory of money, and the dangers of price inflation from expansions in money and credit. He is a sort of modern John Law, seeking prosperity through an expansion of social credit, in place of Law's bank notes.

The Hon. R. H. Bra presents "A Banker's View of the Problem." The chaos in .e realm of money, credit and banking, Mr. Brand attributes largely to the war. Some nations have borrowed too much, others are too rich in gold. An entirely unbalanced situation has developed, which led to the collapse of prices and credit. "The history of the last three or four years is the history of a death struggle between debtor and creditor countries, in the course of which the world's monetary mechanism and international trade has gone by the board." (p. 80) The remedy lies in a resurrection of international trade and a return to an international standard of money. "My opinion is that we shall ultimately find a return to gold at new parities the least unsatisfactory method of recreating such a standard." (p. 84)

Mrs. Barbara Wootton spoke on "The Necessity of Planning." Although the title to the book is *The Burden of Plenty* Mrs. Wootton insists that this is a misnomer. "To make a nightmare out of plenty is just the work of hysterical imagination." "This is not a crisis of plenty. It is a crisis of sale. Things are produced but they cannot be sold. And they cannot be sold because buyers and sellers cannot agree upon prices." (p. 93) In the midst of this so-called burden of plenty, capitalists have tried to find prosperity by eliminating the plenty. This is attacking poverty at the wrong end. The remedy is *planning*, but of the right sort. "In the Soviet Union the whole is planned and every detail is chaos, whereas in the rest of the world every detail is planned and the whole is chaos." The need is for intelligent planning both for the whole and for the details.

Professor Lionel Robbins treated of the two-fold roots of the great depression: *inflationism* and *intervention*. He gives us the orthodox defense of the capitalistic system functioning through the profits motive and the price mechanism. The automatic forces would control the situation if it were not for inflation and government intervention. The trouble is not with bad functioning of the automatic forces or freedom of enterprise. Chaos and depression have come and continued overlong because the normal functioning of the system has been interfered with. The cure is not more planning, but a release from overplanning and bad planning.

[1] The address delivered by J. M. Keynes was omitted at the request of Mr. Keynes because he thought it spoiled a talk *as a talk* if one prepared it with the knowledge that it was to be reproduced in print. A brief digest is inserted by the editor.

Sir Arthur Salter stands mid-way between Mrs. Wootton with her enthusiasm for planning and Robbins with his supreme faith in the automatic forces. He says both methods are right. Government intervention should work a redistribution of income through taxation linked with increased expenditures for health, recreation, education, etc., and public utilities should be extended with managed monopoly. Then most of the economic system could be left to work itself out through the automatic forces.

Graham Hutton gave the concluding summation. He stressed the points of agreement and disagreement. All agreed that the economic system was ill. All agreed that it was unbalanced. None of them wished to cure the burden of plenty by abolishing the plenty. The major divergence was overeconomic planning. Messrs. Brand, Robbins and Henderson wanted the unnatural and artificial restraints removed so that there could be greater freedom of enterprise and smoother functioning of a flexible price mechanism. Dalton, Wootton, Hobson and Orage have lost faith in the automatic forces and lean to planning of various types to create order and dispel the chaos. Keynes and Salter believe in "purposeful planning" by entrepreneurs with respect to the probable future, but oppose an all-embracing planned economy. The Editor, Mr. Hutton, seems to have despaired of order through free markets and free enterprise. "They seem to be gone forever," he says. Therefore, we must have planning and control. This control according to Hutton can travel along one of three lines, Fascism, Socialism, or Communism, but in any event away from free enterprise.

Since the book is one of multiple authorship in which the varying issues and points of view are ably criticized and defended, there is little need for further appraisal here. The reviewer does feel, however, that neither the merits of planning, nor the demerits of free enterprise, are as obvious as they appear to Mr. Hutton. In this connection we cannot help but recall a bit of economic planning on the part of governments in the post-war period. During the decade of the "20's" the victorious nations insisted that reparations and the Inter-Allied War Debts be paid in full. These same governments raised import duties higher and higher and moved rapidly in the direction of economic nationalism. With one hand they planned for the collection of debts and reparations. With the other hand they planned the impossibility of payment. Of course, enforced collection and prohibited payment led to an economic impasse, the Hoover Moratorium, and a world-wide frozen credit structure. Such was the wisdom and success of economic planning when carried on by government intervention.

During this same period, the people in the United States witnessed an experiment in economic planning by business men. Countless trade associations were formed for the purpose of controlling production and regulating prices. Their economic planning was built around the formula of "economic stabilization through price stabilization." Reductions in price failed to follow reductions in cost and prosperity was sought through planned scarcity and high prices. (See "Income and Economic Progress" by Moulton, pp. 138-40.) The writer feels that the economic order would have met the post-war strains with greater success had there been more freedom among enterprisers and a more flexible price structure.

Government planning tends to be characterized by a lack of wisdom, and *private* planning tends to be characterized by short-sighted self-interest inimical to the public good. Mr. Hutton may be right when he says that a planned economy is on the way and when it comes it will take the form of Fascism, Socialism, or Communism. But, if and when, one of these planned economies is set up, we shall still expect to suffer from ignorance and selfishness. By HARLAN L. MCCRACKEN, Professor of Economics, Louisiana State University, Baton Rouge, La.

Aptitudes and Aptitude Testing. By Walter Van Dyke Bingham. Harper & Brothers, Publishers, New York and London, 1937, pages ix, 390. ($3.00.)

There are probably not more than twenty vocational counselors in the country who are competent to use scientific measures for the analysis of aptitudes and to give sound interpretations of their findings in such a manner that a young person will profit from the procedure. This book has been written by one of the masters in this most difficult field of evaluation of human potentialities. As a dealer in "futures" he has been outstandingly successful. Many men, now occupying positions of high responsibility, were guided in their youth by him. In this book he has discussed techniques and methods, developed theories, and defined terms. Interwoven throughout its pages are many cautions that should be heavily scored for the counselor who would attempt to lead another person toward a vocational choice. While the volume is filled with detailed information concerning vocational opportunities, testing methods, and statistical methods, the fact is inescapable that the counselor must be a well-rounded person, familiar with people and the methods they use in earning livelihoods as well as a scientist if he is to deal with aptitudes in a comprehensive fashion.

Specifically, *Aptitudes and Aptitude Testing* deals with the following pertinent questions. "Can tests now available be depended upon to bring to light anything of importance about a person which a shrewd, sympathetic listener cannot learn in interview, after looking at records of past accomplishments while at school and at work? Has the analysis and identification of factors conditioning subsequent progress been sufficiently thorough and detailed? Are test scores reliable enough to warrant reference to them when making individual diagnoses, as well as when comparing groups? In any event, is not the giving of tests, and, more especially, the interpretation of results, so complicated and technical that only the few who have long specialized in aptitude measurement should venture to give any consideration to test data when counseling? Of what value can records of test performance be to educators, employers, placement officers, and others who consult with individuals about their plans? Pointed questions, these. They cannot be dismissed with a word; for the replies presuppose a background of understanding with regard to the nature of aptitudes, the fields of occupation, and the theory of mental measurement."

The book, which is adequately indexed, is divided into three parts, which deal with (1) aptitudes and guidance, (2) orientation within the world of work, and (3) the practice of testing.

The author assumes that aptitudes are relatively stable and that individuals differ in their potentialities for vocational success. "Aptitude" is considered as "a condition indicative of a person's power to acquire specified behavioral patterns of in-

terest, knowledge, and skill." It is emphasized that "aptitude tests do not directly measure future accomplishment. They make no such pretense. They measure present performance. Then, in so far as behavior, past and present, is known to be symptomatic of future potentialities, the test data supply a means of estimating those potentialities. The estimate is necessarily in terms of probabilities only." The main effort of scientific workers in this field is to improve the validity of their procedures so as to be able to predict the chances of success more accurately.

The section on the world of work is a mine of information regarding the market for the investment of time and talent, represented by one's aptitudes. Lists of occupations are given, suggesting many occupational opportunities. The analysis of occupational trends shows avenues of employment that are increasing or decreasing in importance. A comprehensive report is made, chapter by chapter, on what is now known about the aptitudes that are essential in manual work, skilled trades, clerical occupations, and in the professions such as engineering, law, medicine, nursing, teaching, music, and art. Engineers who have not considered recent advances in methods of inducting young men into their profession will be surprised to learn how much aid can be given to a young man today who asks the question, "Should I become an engineer?"

The third portion of the book has been written for the technician to aid in the selection, administration, and interpretation of tests. It is no dry collection of catalog lists, tables, and formulas. The whole concept of probability is again restated in such a manner that the counselor who is inclined to place too much faith in many of the available tests will pause to examine the tools that he uses. A careful study of this section of the book will do much to improve counseling and to inspire workers to improve their methods. The appendix contains descriptions of many interesting and important tests for measuring various aptitudes. In many cases norms and standards are given for the interpretation of results, and important bibliographical references are indicated.

This book by Dr. Bingham is of outstanding importance for the vocational counselor. It is of equal value to professional men who made their own vocational choices years ago but who are asked, from time to time, to give advice to young people regarding the choice of careers. It is a matter of deep satisfaction to know, from an authoritative source, that great advances have been made in the measurement of aptitudes and to have available, in highly readable form, the wealth of information that has been assembled on this subject. This book has been written by an eminent applied psychologist, not for his professional colleagues alone, but for all of us who deal with people in a working relationship. By RICHARD STEPHEN UHRBROCK, Head of Research Department, Industrial Relations Division, The Procter & Gamble Company, Ivorydale, Ohio.

For Top-Executives Only. By Samuel W. Reyburn, Kenneth Goode, Alfred P. Sloan, Jr., C. M. Chester, Sanford E. Thompson, J. George Frederick. The Business Bourse, New York, 1936, pages viii, 383. ($5.00.)

Another of The Business Bourse's popular books, this one is divided into three parts:

The first empirically breaks down the eras of so-called business leadership into seven broad phases and describes the special qualities which made the leaders of each period outstanding.

In tracing the trend from the rugged, autocratic executive methods of the past to the broad-gauged, objective and analytical types successful today, it projects into the future the hypothesis of what will be necessary for a successful top executive of the next period.

The new executive will be "market-minded," have labor and consumer interests very much in mind, and, while he will not forget to watch for profits, he will be more concerned with the social value of his organization than previously. He must be adaptable and be prepared for frequent changes.

The advances in executive technique are traced and the conclusion drawn that "experience" in a particular industry (the working up from within idea) is no longer a major executive virtue. Instead, executive management itself is a line of business, a technique, and capable executive management ability in one line is largely transferable to another line. The brief is held for the professional top executive able to function in almost any line of business. This has led to the development of a science of executive management.

Mr. Frederick, who is the author of the first part, or Book I, indicates the trend in general business policy to what he calls "low-price technics" which may be described as a bold shift in business policy toward revolutionary low prices—so low as not only to compel remodeled and specialized techniques of manufacture and distribution to attain it, but so low as to increase purchasing power enormously, widen the market and invite desire to buy.

The second part of the book contains chapters by outstanding executives and maintains the tone and approach begun by Mr. Frederick in part I. The chapter by Sanford E. Thompson is particularly valuable in clarifying the need for attention to the shift from production management to marketing management.

The third part of the book deals with the new relation of government and business. Again a chapter by Mr. Frederick and two chapters by Mr. Alfred P. Sloan, Jr., and Mr. C. M. Chester.

On the whole, this book contains some pretty sound advice for executives. By EVELYN BUCKLEY.

Better Foremanship. By Glen L. Gardiner. McGraw-Hill Book Company, Inc., New York and London, 1936, pages x, 323. ($2.50.)

"Better Foremanship" might well have been named an "Encyclopedia of Modern Foremanship." The author has unerringly included those problems of personnel leadership, production and economics which constitute the entire burden of "front-line" factory supervision. The book is an effective answer to the obsolescent theory that text material is undesirable as an aid in the training of foremen. The questions used throughout as subtitles are as provocative of thought as the author's answers.

Part 3, "What Every Foreman Should Know About Today's Economic Situation," leads into a field of thought containing many problems which, while of vital interest to foremen, are many-sided and as yet unsolved. The treatment of

such problems as the Distribution of Wealth, Technological Unemployment, and Profits is didactic and it carries too obviously an implication of finality to satisfy the many truth-seeking individuals at present found in factory supervision.

"Better Foremanship," as a whole, fulfills a long-standing need for a comprehensive guide to study for both groups and individual foremen desiring a better perspective of their jobs. By J. H. VERTREES, Rutgers University, New Brunswick, N. J.

The Clash of Progress and Security. By Allan G. B. Fisher. The Macmillan Company, New York and London, 1935, pages xiii, 234. ($3.00.)

A readable book, of insight and perspective, it attributes depressions to the way we humans,—consumers, hand and brain workers and investors,—reject the changes and grasp the material progress that are the Siamese twin products of our relentless search for knowledge. There is no security from change save in mastering a will and a technique to give society the changes it needs, and on time. A book that includes hard-headed suggestions for economic mechanisms, while going behind mechanisms to the mainsprings of human behavior, is economics on the grand scale. The United States is prolific with fragmentary views and New Zealand comes through with a mountain-top panorama! Our sociologists and ministers should study this analysis of the economic aspect of the forces arrayed against their regenerated world. It should be condensed in a more popular style, in the 25c series, for the general public, and used by our bank economists and labor unions in their monthly bulletins.

Fisher's theory is: (1) There are three periods in industry: (a) Primary (agriculture and pastoral), (b) Secondary (necessity manufactures), and (c) Tertiary (luxury manufactures and services); (2) From primary and secondary industry in turn, advancing knowledge releases capital and labor; (3) Unemployment and depression result unless such releases are immediately transferred to the next following class; (4) So immense are the difficulties of Transfer that idle labor and capital pile up quickly, especially in Tertiary industry where we now are (this checks with W. H. Lough[1] who calls tertiary manufactures "caprice goods" that consumers buy capriciously in alternate enormous and negligible amounts); (5) Revival in the tertiary period need not wait on new inventions (automobiles), small industries previously working for the well-to-do can be expanded (small sailboats); (6) A depression is the time required for people to shift their consumption, work and investing habits out of old, sufficiently expanded industries into smaller undeveloped lines.

Fisher suggests two procedures: (1) slow up the necessity for transfers with three useful but entirely inadequate brakes—shorter work hours, redistribution of income and lower prices (Brookings' main idea)—to renew the life of old, but elastic-demand, industries (milk and housing); (2) overcome the obstacles that now prevent rapid transfers.

The *consumer* obstacle is oversaving and reluctance to buying unaccustomed things. Fisher suggests shorter hours to assist industry and services catering to leisure time, more education, educational advertising by industries, and more free services by government. *Labor,* manual and professional, holds fast to old jobs and skills and maintains bars against newcomers. He suggests better education, re-education and retraining for new jobs. *Investors* resist writing off outmoded investments and shifting into new,—even pouring additional money into already overexpanded industry (cotton textiles). Fisher suggests investment pools that will deliberately risk a share of the pool in new industries and in existing small but prosperous elastic-demand industries. *Business men,* by defending their particular business with secrecy and their profits with stabilized or rising prices, help bring on a depression that ruins all business and profits. Fisher suggests (1) a central organization to which business men may confide raw economic data, and (2) free prices that will permit (a) the differential increases in prices and profits that identify an industry that can use a transfer of surplus capital and labor, and (b) the differential decreases that warn against additional investment and signal transfers from (cotton textiles). *Government,* promoting stabilization with tariffs and national planning, defeats itself. Fisher believes planning should aim chiefly at slowing the necessity for transfer and overcoming obstacles that prevent rapid transfer,—all on an international scale. He discusses high taxes on profits without a decision, but I think he would agree with D. M. Figart.[2]

It is a keen intellectual performance but the book is entirely qualitative. We need a quantitative analysis of human capacity for change and of the magnitude of the forces involved—the forces of progress, the forces that can delay and regulate the march of progress and the forces that can better prepare the way of progress. A statistical study, in terms of Fisher's ideas, of a period including two or three depressions might do the job. Adequate qualitative and quantitative insight are the conditions precedent to really adequate thinking by economists and to intelligent action by the public. By HAROLD M. DAVIS, Industrial Engineer, Nashua Gummed and Coated Paper Company, Nashua, N. H.

The Engineer and Human Values in Industry

(Continued from page 84)

short-cut, we may then set our minds to the organization of personnel plans. Good industrial relations in your plant and mine depend first and always on the *spirit* of good relations.

We who are engineers, have many times smiled at the way in which an old-timer has followed rule-of-thumb methods when more reliable techniques provide a much safer rule and avoid wear and tear on the thumb. It is not too much to expect—in fact it is inevitable—that rule-of-thumb methods of dealing with employes and directing their work will likewise become rapidly obsolete. If we do not think so today, competition and our employes will shout it in our ears tomorrow.

[1] "Consumers' Retail Purchases, Pre-War and Post-War," *Bulletin of the Taylor Society,* Vol. XVI, No. 6, December, 1931.

[2] "The Tax on Undistributed Profits," *The Society for the Advancement of Management Journal,* Vol. I, No. 5, November, 1936.